



NV30 Revealed ■ Intel Pentium 4 3.06GHz ■ Shuttle XPC SB51G

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COMPUTER POWER USER



Q&A
With
Rob Glaser:
Keepin'
It Real

*** HD-BURN:**
Doubling CD-R
Capacity
(page 43)



12

*** Media
Players
Reviewed**
(page 66)

*** Strained
Silicon & Prescott**
(page 40)

*** Create A
Silent PC**
(page 101)



Regular Columnists

- Anand Lal Shimpi
- Alex "Sharky" Ross
- Kyle Bennett
- Chris Pirillo
- Pete Loshin
- Lisa Lopuck
- Rob "CmdrTaco" Malda
- Joan Wood
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Hardware Reviews

- Koolance EXOS
- Logitech MX700
- Archos Jukebox Recorder 20
- Sony Vaio PictureBook C1MW

January 2003
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HOT VIDEO CARDS

(page 48)



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MultiSync LCD 1850X

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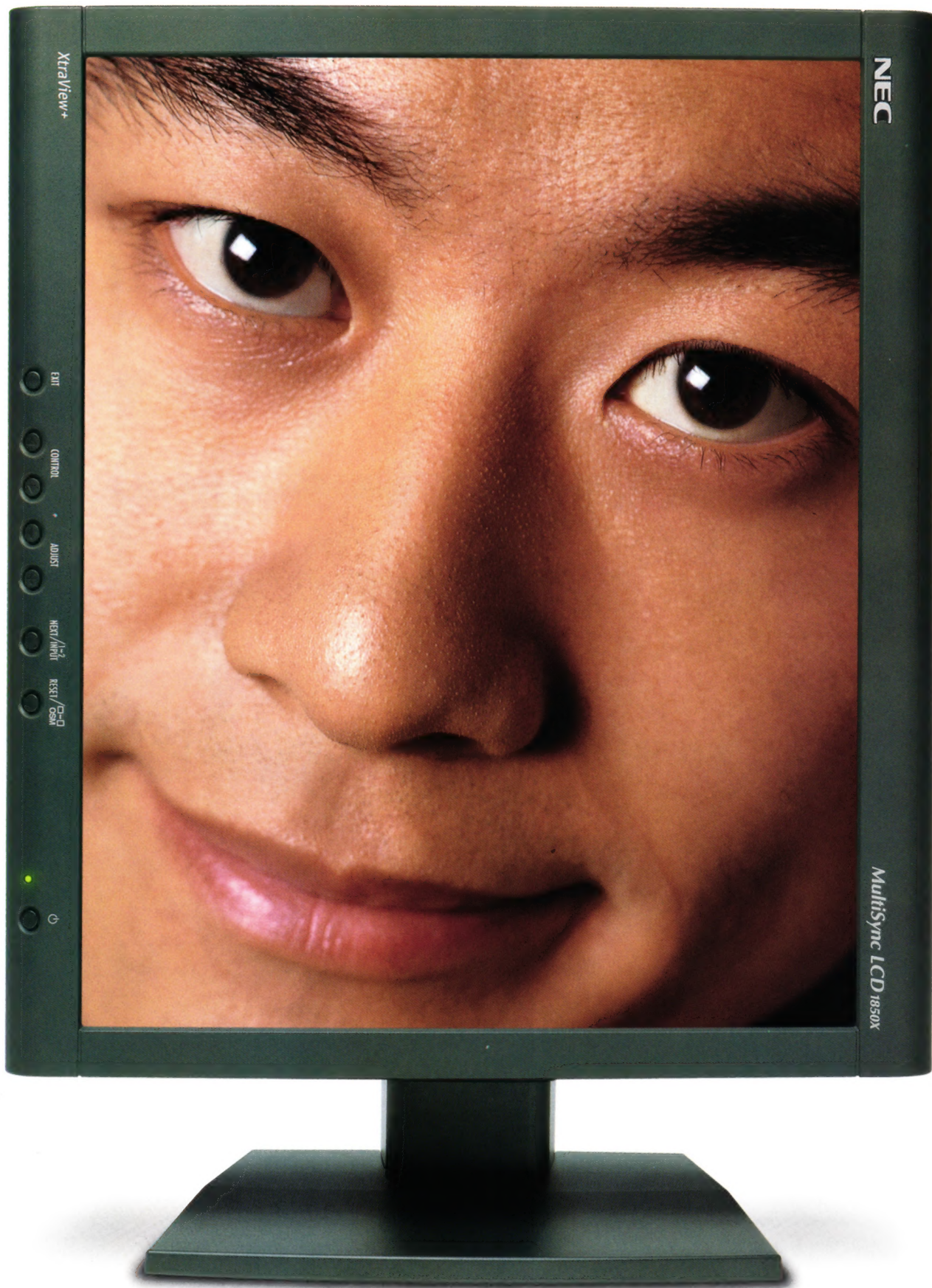
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HOT VIDEO CARDS

Spotlight

48

A New Year Of Resolutions

The Right Video Card For Every User

50

Video Cards Exposed

The Material You Are About To Read Is Extremely Graphic

Frontside

- 6 What's Happening
- 12 Digital Economy
- 13 **The Saint**
The Way PCs Ought To Be

The Experts



Joan Wood
Forward Slash
page 84



Lisa Lopuck
Site Scene
page 82



Chris Pirillo
Dialogue Box
page 72



Kyle Bennett
[H]ard Talk
page 34



Alex St. John
The Saint
page 13



Anand Lal Shimpi
Anand's Corner
page 32



Alex "Sharky" Ross
The Shark Tank
page 33



Rob "CmdrTaco" Malda
The Department Of Stuff
page 83



Pete Loshin
Open Sauce
page 73

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Did you find the hidden CPU logo on our cover?
Turn the page for the answer.



Heavy Gear

- 16 **Extreme Hardware**
These Gizmos Don't Sing It, They Bring It
- 19 Shuttle PC XPC SB51G Barebones PC
- 20 Intel Pentium 4 3.06GHz
- 22 MSI GF4TI4200
Gigabyte Maya R9000 Pro
- 23 Gigabyte Maya II
Hitachi CML190B LCD
- 24 Seagate Barracuda ATA V 120GB
Archos Jukebox Recorder 20
- 25 First International irock! MP3 Player
Plexor Plexwriter 48/24/48A
- 26 Kodak Professional 8500 Digital
Photo Printer
HP PhotoSmart 7550 Photo Printer
- 27 Toshiba PDR-2300 Camera
Nikon Coolpix 4300 Camera
- 28 Eye Control Technologies NaturalPoint
Smart-Nav AT
Koolance EXOS
- 29 Logitech MX700 Mouse
Microsoft Optical Mouse blue
- 30 Panasonic Toughbook 72
- 31 Sony VAIO PictureBook C1MW
- Web** Sony 48X/12X/48X CD-RW
- Web** Yamaha CRW-FIZE 44X/24X/44X
CD-RW
- 32 **Anand's Corner**
MCE For Me?
- 33 **The Shark Tank**
ATI Spreads Its Wings
- 34 **[H]ard Talk**
OCin' In The New Year



Hard Hat Area

- 36 **The PC Challenge:** Best PC For
Integration Into Your Home Theatre
For Less Than \$999
- 38 **Swappin' Parts: The Return**
Back To The Basics



- 40 **X-ray Vision:** Strained Silicon Yields
Gain Without The Pain
- 43 **White Paper: HD-BURN**
Bridging The Gap From CDs To DVDs

Loading Zone

- 64 **The Bleeding Edge Of Software**
Inside The World Of Betas
- 66 **Manage Your Media**
A Slew Of Players For Your Review
- 70 Sam-I-Am, Would You Like A Good PIM?
Micro Logic Info Select 6
askSam Systems askSam 5.0
- 71 Give Your PC A Full-Body Scan
Sandra Professional 2002 SP1
- 72 **Dialogue Box**
Veni Vidi Video
- 73 **Open Sauce**
Wishful Thinking & Free Computing

Caught In The Web

- 74 **Fringe**
- 76 **AtomShockwave**
Short-Format Video Is Poised
For The Big Time



- 80 **Coder's Corner: XML**
XSLT: Transforming XML

- 82 **Site Scene**
Conducting A Site Audit
- 83 **The Department Of Stuff**
switched.txt
- 84 **Forward Slash**
Leaks & Waves



Digital Living

- 86 **Road Warrior**
Tungsten's Debut, Palm OS 5.0
Compatibility Checkup, Dana's On The
Scene, A PowerBook Look-Alike & More
From The Mobile Front
- 90 **At Your Leisure**
(Holiday Gift Guide Part II)
Plug In, Sit Back & Fire Away

Tips & Tricks

- 95 **Software Tips & Projects**
Buzzing Around Windows' Serious
Registry Editing Tools
- 98 **Warm Up To Penguins**
The Tricky World Of Video In Linux
- 101 **Killer Hardware Tips**
A Sweetly Silent PC, Wavering On
Wireless & Giving Newton A New Life

What's Cooking

- 103 **Technically Speaking**
An Interview With Bob Young, Co-
Founder & Former CEO Of Red Hat Linux
- 106 **Under Development**
A Peek At What's Brewing In The
Laboratory

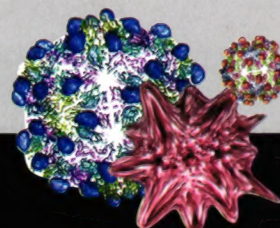
Back Door

- 108 **Q&A With Rob Glaser**

Infinite Loops

Strange stats and other
oddball items from
computing's periphery

74, 94, 96, 99, 102



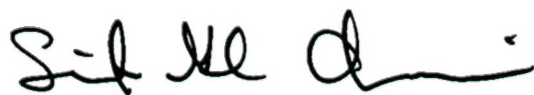
GREETINGS FROM SAMITLAND

Hi. I'm here to tell you that we have some molten post-Thanksgiving treats ready for you this month! We've been working with NVIDIA for months to get you the scoop on the GeForce FX (formerly known as the NV30); the company's hot new baby is looking mighty cool as you can tell from the prototype cooling mechanism on the cover. Oi! And before I forget, kudos to our man Brian Burke over at NVIDIA for all his help and support. I've known him since his STB and 3dfx days, and IMHO, he's been steadily solidifying his position as one of the best PR guys on the planet. (And if you were familiar with only half the smack we talk about PR flacks, you'd know what a huge compliment that is.) Anyway, thanks for all your help, Brian. Meanwhile, back at the farm: There's nothing better than when ATI and NVIDIA give each other a run for the money. After all, it usually ends up with more competitively priced video cards for the rest of us, the riff-raff.

But I digress, as usual; our video card coverage doesn't just end with NVIDIA, noooo sirreee. For those of you who don't give a hoot (don't pollute) about the cards that gamers love, we have a whole gamut of cards for the mainstream, workstations, and mobile computing. Head over to page 48 to check out our Spotlight section. I doubt you'll be disappointed.

Some of you will remember our Swappin' Parts section. Well, it's baaaack. We have a little competition going on, so head over to page 38 to give us your naming suggestions for the next MERLE (Mediocre Electronic Refurbished Low-end Equipment). You stand to win a brand-new ATC-201b SXX case donated for this very purpose by the folks at Cooler Master. C'mon, let's get those suggestions rolling into swappinparts@cpumag.com.

Hmmm, is it that time already? Well, I'd best be off. Julie and I are heading over to my parents' place in Kolkata, India. So if I don't catch you on the CPU forums before we leave, be good and stay safe over the holidays. Be well. See you next month.



Samit G. Choudhuri, Publication Editor, CPU



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CORRECTIONS

Page 56 / Dec 2002 issue
That's an Intel-based Asus board pic we printed instead of an nForce2. Our bad.



Gotcha.
Here it is.

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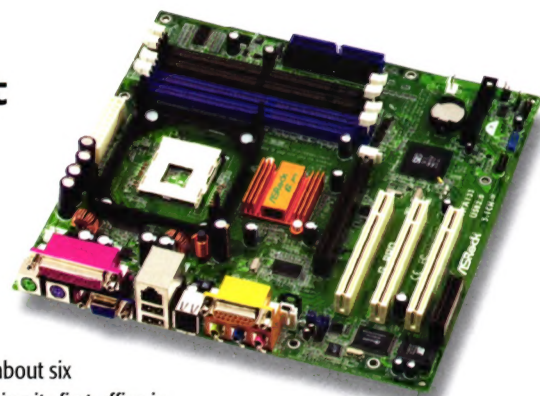
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New Entry Rocks Low-End Mobo Market

Many motherboard manufacturers are keeping a wary eye on the 2002 entry into the market of ASRock, an ASUSTeK Computer's Hua Ching subsidiary.

The ASRock motherboards, which appeared first in Asia in late 2002, should provide some strong competition in the low-priced motherboard market. ASRock boards will be flexible, offering slots for both DDR and SDRAM DIMM. The boards also include universal CPU overheating protection. The ASRock P4145D motherboard supports HyperThreading technology. In fact, many motherboard manufacturers are already preparing to cut prices to meet the ASRock competition head-on. ASRock motherboards will cost \$50 and more. ▲

ASRock introduced its first motherboard about six months after establishing its first office in Taipei in May 2002.



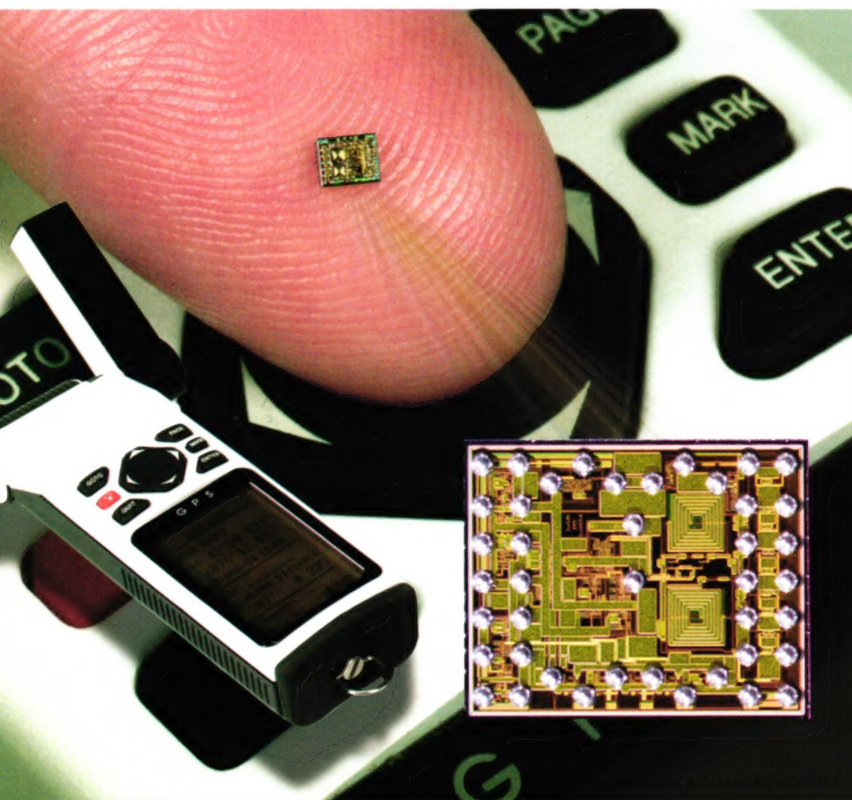
Opteron Gains Super Status

A new supercomputer reportedly will buck a common trend by incorporating microprocessors from AMD rather than those from Intel. A company called Cray, which happens to know a thing or two about supercomputing, will build the Red Storm supercomputer for about \$90 million for Sandia National Laboratories, which develops technology key to U.S. national security. Red Storm reportedly will feature microprocessors from



the Opteron line from AMD. Nearly all other supercomputers feature microprocessors from Intel.

Sandia officials expect Red Storm to perform 40 trillion calculations (40 teraflops) per second. Red Storm will make use of more than 10,000 connected processors. Upon its 2004 introduction, Red Storm will be slightly slower than the NEC-developed Earth Simulator supercomputer. But Red Storm's upgradeable design eventually should make it the world's fastest supercomputer. ▲



A future IBM high-speed transistor, similar to the one shown here, will be aimed at communications devices.

IBM Researchers Working Fast & Small

If you want to see the latest advances in chips from IBM, you can stop looking immediately . . . unless you have a really powerful microscope, that is. IBM claims to have built the world's fastest transistor, which is the microscopic electronic switch that is the building block of computer chips. The IBM transistor combines silicon and germanium and can run at speeds as fast as 350 billion cycles per second. IBM expects within two years to release a high-speed communications chip based on the new transistor, which will feature low power consumption, making it ideal for cell phones and wireless networks.

In addition, IBM researchers recently claimed to have developed the smallest multiple logic computer circuit in history, measuring 12nm x 17nm. The newly developed circuit, which uses carbon monoxide molecules, is about 180,000 times smaller than the circuits developed with today's technologies. However, IBM estimates it will take at least 10 years before the tiny circuit could appear in a PC. ▲

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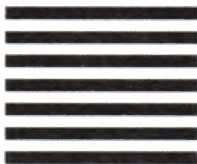
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Securing Precise Wireless Signals

Researchers at a British university hope a new optical antenna that can detect a data signal on a single wavelength of light will greatly improve security for wireless networking in the future. The researchers at the University of Warwick say their optical antenna can detect a signal about 100 times more precisely than current optical antennas.

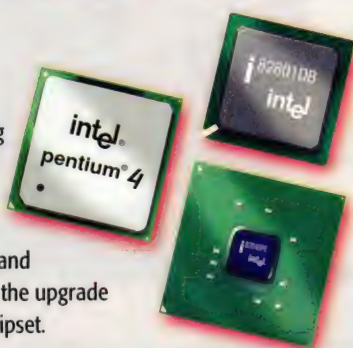
Today's wireless networking options use radio frequencies, which are susceptible to hacking. Optical antennas make use of infrared signals, which are more focused than radio frequencies. Optical Antenna Solutions of Nottingham, England, has licensed the antenna. At least initially, its developers are considering using the antennas in infrared credit card payment systems. ▲



Hardware Mole

Our endearingly myopic hardware mole always has one ear to the ground. Here's his scuttlebutt at press time.

Intel's upcoming Springdale chipset will support the Pentium 4 chip and should serve as the upgrade to Intel's 845 chipset.



Intel Overclocking Rumors Fly

According to industry rumors, it appears Intel will introduce overclocking functions—among other surprises—when it releases its Springdale chipsets, scheduled to appear in the third quarter of 2003. Word has it that Intel will introduce a motherboard, currently code-named “Rapid City,” that will support overclocking. The Rapid City motherboard would feature an impressive-looking black PCB and would appear at the same time as

Springdale, which will support the Pentium 4 chip. Although many industry experts are skeptical about the Intel overclocking rumors, the rumors certainly give us a reason to eagerly await the Springdale release.

Granite Bay Shows Promise, Problems

At the fall Intel Developer Forum's Technology Showcase, Intel demonstrated its Granite Bay chipset (also called E7205). Granite Bay, built for use with the Pentium 4, features 4.2GBps of bandwidth. The chipset also supports AGP 8X, dual-channel DDR 266 memory, and HyperThreading technology.

A few motherboard products featuring Granite Bay might be available by the beginning of 2003, although there have been some delays in Granite Bay's release date. Despite its powerful features, some industry analysts say Granite Bay's high expense, along with a glut of recently released and upcoming chipsets, may make motherboard manufacturers slow to incorporate Granite Bay into products.

Monitor Or TV?

Gamers want—and deserve—plenty of choices. Select a human opponent or a computer opponent? Use the Rams or the Bengals in Madden NFL 2003? (OK, that's not much of a choice.) Here's a cool choice, though: Do you want to view your Xbox or Game Cube games on a TV or on your monitor? Key Digital Systems' X-Blaster lets you choose the latter for \$249.

The X-Blaster lets you use the PC monitor both with your computer and with your game console, switching between the two as needed. Xbox players can make use of a resolution up to 1,280 x 720 when playing a game.



Intel senior vice president Mike Fister introduced the Granite Bay chipset at the fall IDF.

To continue the tradition established way back in July 2002, we bring you a page of the choicest chip news. Enjoy!

A Billion-Transistor Budget

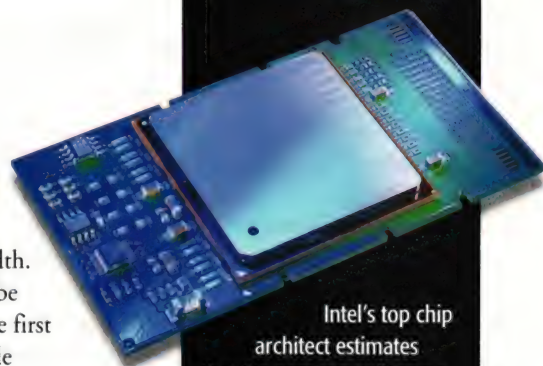
John Crawford, an Intel fellow who has been a top architect at the chip maker since the design of the 386, says that putting 1 billion transistors on a chip will be fairly easy by 2007, when the company will be creating circuits that are 45 nanometers in width. (By comparison, an influenza virus is 100 nanometers wide.) Crawford thinks it won't be too hard to make use of all those transistors, which would compare to 42 million for the first Pentium 4 chip. He estimates that the company can put four Itanium 2 cores on a single chip and still have room for 12MB to 16MB of cache. But it won't be easy keeping the power consumption of the chip low, and verification will be an enormous headache, Crawford says. Anyone care to test a billion transistors for all possible calculations? ▲

Hammer Time's Comin'

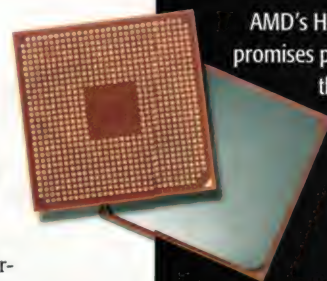
AMD has been chasing Intel for a long time in microprocessors. But when you're losing the race in megahertz, it pays to have other tricks to beef up performance. Fred Weber, vice president and chief technology officer of AMD's computation products group, says that the upcoming Opteron chips from the company's new line of Hammer 64-bit microprocessors will be able to blow Intel's top chips away. He contends that an Opteron chip operating at just 1.8GHz will be able to crank out spec benchmark scores of 1,202 for integer performance and 1,170 for floating point performance, compared to only 900 scores for Intel's 2.8GHz Pentium 4 chips. That means AMD can lag behind Intel in megahertz but still beat it on performance, thanks to improvements such as better memory management on the Opteron. Now if only AMD can get the chip out. ▲

PowerPC Gets An Upgrade

Expect Apple Computer's machines to get speedier next year as the company adopts the latest microprocessor from IBM. Big Blue has created the PowerPC 970, running at initial speeds up to 1.8GHz. The 970 is a single-core version of last year's POWER4 chip, which crammed four different processor cores into a single chip for the server market. IBM says that the chip is a big step up from its 1GHz PowerPC, in particular because it has a high-speed bus between the processor and memory that runs at 900MHz. Even at the relatively slow gigahertz rating, performance won't be anything to sneeze at. The chip is expected to be available in 2003. ▲



Intel's top chip architect estimates that the company will someday be able to fit four Itanium 2 cores on one chip.



AMD's Hammer chip promises performance that can beat Intel's faster clock CPUs.

Watching The Chips Fall

Here's a rundown of the latest AMD and Intel CPU pricing information compared with initial release pricing.

	CPU	Released	Original Price	Current Price	Last Month's Price
	AMD Athlon XP 1600+	10/09/2001	\$160	\$54	\$55
	AMD Athlon XP 1700+	10/09/2001	\$190	\$66	\$62
	AMD Athlon XP 1800+	10/09/2001	\$252	\$72	\$73
	AMD Athlon XP 1900+	11/05/2001	\$269	\$81	\$82
	AMD Athlon XP 2000+	01/07/2002	\$339	\$93	\$93
	AMD Athlon XP 2100+	03/13/2002	\$420	\$110	\$119
	AMD Athlon XP 2200+, 0.13 micron	06/10/2002	\$241	\$144	\$147*
	AMD Athlon XP 2400+	08/21/2002	\$193**	\$185	\$193**
	AMD Athlon XP 2600+	08/21/2002	\$297**	\$295	\$297**
	AMD Athlon XP 2700+, 333 MHz FSB	Q4 2002	\$349**	\$349**	\$349**
	AMD Athlon XP 2800+, 333 MHz FSB	Q1 2003	\$397**	\$397**	\$397**
	Intel Pentium 4 1.5GHz	11/20/2000	\$819	\$106	\$106
	Intel Pentium 4 1.6GHz	04/23/2001	\$294	\$114	\$116
	Intel Pentium 4 1.7GHz	04/23/2001	\$352	\$121	\$123
	Intel Pentium 4 1.8GHz	07/02/2001	\$562	\$135	\$136
	Intel Pentium 4 1.9GHz	08/27/2001	\$375	\$146	\$157
	Intel Pentium 4 2GHz	08/27/2001	\$562	\$153	\$169
	Intel Pentium 4 2.2GHz	01/07/2002	\$562	\$193	\$195
	Intel Pentium 4 2.4GHz, 400MHz FSB	04/02/2002	\$562	\$186	\$185*
	Intel Pentium 4 2.5GHz, 400MHz FSB	08/26/2002	\$243**	\$248	\$248.48*
	Intel Pentium 4 2.6GHz, 400MHz FSB	08/26/2002	\$401**	\$386	\$386*
	Intel Pentium 4 2.26GHz, 533MHz FSB	05/06/2002	\$423	\$191*	\$186*
	Intel Pentium 4 2.4GHz, 533MHz FSB	05/06/2002	\$562	\$186*	\$185*
	Intel Pentium 4 2.53GHz, 533MHz FSB	05/06/2002	\$637	\$236*	\$235*
	Intel Pentium 4 2.66GHz, 533MHz FSB	08/26/2002	\$401**	\$379*	\$374*
	Intel Pentium 4 2.8GHz, 533MHz FSB	08/26/2002	\$508**	\$457*	\$471

* Retail price.

** Manufacturer price per 1,000 units.

Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com.

Wi-Fi™ Adding Hi-Security

If the lack of a high-security standard was causing a bump in the road concerning the rise in the popularity of Wi-Fi, introduction of the WPA standard should smooth things. The Wi-Fi Alliance, which oversees the Wi-Fi wireless networking technology (also known as 802.11b), hopes the WPA (Wi-Fi Protected Access) standard will ease security concerns.

Wi-Fi can support wireless networks with a strong signal that carries about 300 feet, making it ideal in many public and private settings. But one drawback of Wi-Fi is the ability of unauthorized users to potentially tap into the network. WPA, which replaces the existing WEP (Wired Equivalent Privacy), addresses such concerns by adding two new security measures. First, it lets network

administrators employ a public-key encryption system for verifying the identity of users trying to log into the Wi-Fi network. Second, WPA incorporates a technology called TKIP (temporal key integrity protocol), which enhances the encryption methods the Wi-Fi network uses to send data and makes the data transmissions far more secure.

If the early returns are any indication, WPA should be a success. Chipmakers Intersil, Proxim, and Texas Instruments immediately announced support for the security protocol and planned to



Officials hope improved high-security standards will ease some concerns over the Wi-Fi wireless networking standard.

incorporate it into new products as quickly as possible. WPA is a subset of the full security protocol, called 802.11i, which should be ready late in 2003. The stop-gap WPA will be ready months sooner in early 2003. ▲

Software Shorts

Here are a few software tidbits we found just before press time.

"Hello, PC? It's The Mac. Send Over The Files."

Even though Macintosh computers and PCs have had some limited direct communication abilities for a few years, making them work together on a significant task has always been difficult. Move2Mac software from Detto Technologies aims to alleviate some of those communications problems, allowing users to transfer files from a PC to a Mac. Those who purchased a new Mac and want to copy data from their old PC probably will realize the most benefit from the \$60 software.

Although Move2Mac doesn't translate files from PC language to Mac language, it does help arrange the files logically on your Mac's hard drive, moving digital music files into the Mac's Music folder, for example.



Ready For Office 11? Your OS Might Not Be

People who poke fun and point fingers at Microsoft may have some new ammunition, based on the early discussions concerning the Microsoft Office 11 beta. Microsoft is reportedly not including support for the Win9x, WinNT, or WinMe operating systems in Office 11. Instead, Office 11 may only run on WinXP or upgraded versions of Win2000.

Some industry analysts say Microsoft will gauge customer reaction before making a final decision on Office 11's OS compatibility. If you'd like to weigh in on Office 11's OS compatibility, visit Microsoft's product suggestion Web page (register.microsoft.com/mswish/suggestion.asp) and fill out the Web form.

Office 11 may only work with the WinXP or Win2000 operating systems.



Copy-Proof CDs Gain Steam

Although the widespread introduction of copy-proof audio CDs is still far from a sure thing, the idea may have received a boost after the late 2002 merger of two rival companies. Problems with the individual anticopying technologies from California-based Macrovision and Israel-based Midbar Tech have helped to discourage record labels from adding the technology to audio CDs. Incompatibilities between the technology and various brands of CD players have caused many of the glitches. However, industry analysts say the combined resources of the two companies should lead to an improved technology standard that the record labels can support.

Warhol Worm: 15 Minutes Of Hacking Fame



Although many Internet security experts have downplayed a recent research paper that claimed a new, sophisticated type of worm could take down the Internet in 15 minutes, the experts haven't exactly called the idea impossible.

The research paper says new types of worms, dubbed Warhol worms (after Andy Warhol's "15 minutes of fame" quote) or Flash worms, will create lists of vulnerabilities found during probes of Internet hosts and equipment. The worm then will modify its attacks, aiming at the specific equipment's vulnerabilities. Such an attack could spread far more quickly

with more pinpointed damage than an attack from a less sophisticated worm, such as the Code Red and Nimda worms deployed. Less sophisticated worms search randomly for a specific vulnerability, which is less effective overall and gives security experts time to combat the problem.

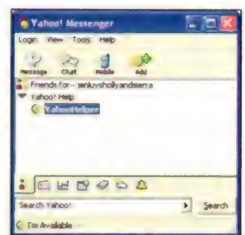
The researchers, who are affiliated with the University of California, Berkeley, say a Warhol worm could work so quickly that security experts would have no chance to combat the problem before it disabled the entire Internet. The reactions from security experts to the research paper have varied, but most agree that such a worm could appear in the future. However, most say it's highly unlikely the widespread damage mentioned in the paper would occur because of the incredible precision that a hacker would need to launch such a destructive worm. ▲

Can't All IM Software Just Get Along? Maybe

The way the companies involved treat it, you'd think IM held the key to controlling the Internet. That point is arguable, but the fighting among the major IM companies (including AOL, Microsoft, and Yahoo!) has been an undebatable reality. Some of the methods the companies have employed to ensure their IM users can't communicate with those using another type of IM software are laughable, or at least they would be if the end users weren't so frustrated with the back-and-forth bickering.

Those days of frustration will be ending if the IETF (Internet Engineering Task Force) has its way. The IETF has given the go-ahead for creation of an IM standard, which would allow different types of IM software to work together.

As we went to press, the major companies involved hadn't commented on the IETF proposal, but Microsoft and IBM have done some preliminary work on an IM standard called SIMPLE (SIP [Session Initiation Protocol] for Instant Messaging and Presence Leveraging Extensions). The IETF accepted SIMPLE as a proposed standard in September 2002. ▲



If a new IM standard becomes reality, Yahoo! Messenger users could communicate with AOL and Microsoft IM users.

Online Music Sales Sing A Sad Song

What's to blame depends on whom you ask, but the result isn't up for debate: Online music sales fell sharply from 2001 to 2002. According to a comScore Media Metrix study, online music sales, which include sales of CDs and streaming media, slipped about 25% in the first three quarters of 2002 compared to the same period a year earlier, falling from \$730 million to \$546 million. The comScore

Media Metrix study surveyed more than 1.5 million Internet users.

Some experts say the dip in online music sales is natural because of the overall slowdown in the market for music sales. But the slide for online sales is far steeper than the slowdown in overall music sales, which were between 5% and 10% lower in the first three quarters of 2002 than the same three quarters in 2001. According to comScore data, online

music sales have accounted for 7% to 9% of all U.S. music sales during the past couple of years.

Some in the music industry blame the slowly increasing re-emergence of music- and file-swapping Web sites. Although no site currently approaches the usage numbers Napster held at its peak, several sites have seen steady increases in traffic in the past several months, comScore says. ▲

Online Music Sales

Online music sales slipped in 2002 compared to 2001 levels.



Source: comScore Media Metrix

Movielink Site Ups Security Before Launch

After two years of planning, those behind the Movielink Web site hope the late decision to use DRM software from Microsoft and Real Networks will provide the necessary security to make the venture a success. The DRM software will help Movielink control how site visitors can use and view the movie files.

Movielink, which launched its Web site service late in 2002, is a collaboration between several large motion picture studios, including MGM, Paramount, Sony, Universal, and Warner Bros. From the Web site, users can "rent" a movie by

Movielink's recent launch was two years in the making.

downloading it from the site and watching it on a PC. The user's rights to the movie expire 24 hours after the user first plays the movie or after 30 days. Films cost between \$2.99 and \$4.99, and users will be able to see films after they are released on video but before they go to pay-per-view television.

Movielink is an attempt by the companies to give users a legal method for watching movies on a PC, rather than turning to



a file-swapping site, which infringes on copyright protections. Skeptics say most computer users currently don't have the desire to watch a movie on a PC, nor do most have the hardware and high-speed Internet connection needed to make the Movielink service work well. ▲

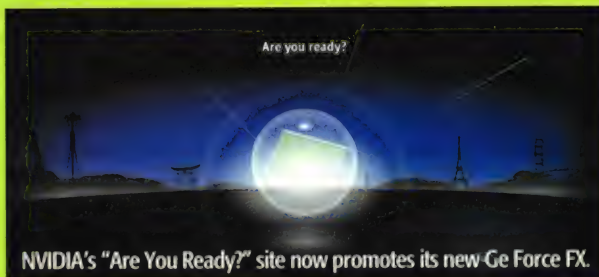
New On The 'Net

Looking for some new surfing destinations? Here's a sampler of the many sites that recently hit the Web.

"Are You Ready?"

NVIDIA had been promoting its NV30 chipset with a Web site (www.nvidia.com/content/areyouready/index.html) that asked, "Are you ready?"

Now that NVIDIA has officially released the GeForce FX at COM-DEX, the site serves up information on the new technology. Visitors to the site can view short movies, read technical briefs, and more. For our coverage on the GeForce FX, see "Video Cards Exposed" on page 50 of this issue.



NVIDIA's "Are You Ready?" site now promotes its new GeForce FX.

Play For Pay

Ever dreamed of becoming a professional gamer? Then the TerraQuest online mystery game is a dream come true. TerraQuest, from MindQuest Entertainment and available at www.terraquest1.com, offers players who solve the various mysteries the chance to win \$25,000 monthly prizes and a \$250,000 jackpot. Users must pay \$25 to \$100 to register, depending on when they start playing.

Be sure to read the official rules. Because of differing laws from state to state, some people are ineligible for cash prizes.

Keep It Active

When you run a search on the Web, you probably use a series of keywords, but this type of search sometimes yields a significant percentage of results you don't want.

Gimpsy (www.gimpsy.com), which calls itself a guide to the Web rather than a search engine, attempts to work around this problem by emphasizing natural language searches over keyword searches. Just type a phrase that explains what you want to do or click one of the action categories on the home page, and Gimpsy will return a focused list of results. Gimpsy's home page skimps on graphics and nonessential information, further simplifying searches.

We found that this type of search was helpful when we wanted information on doing a very specific activity, but it isn't as useful for simply looking for information on a subject. Still, this "guide to the Web" just may find a niche for itself.

BIOS Upgrades Available Online

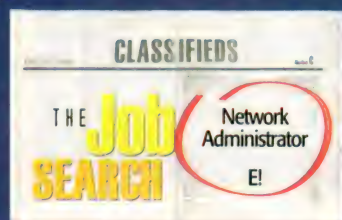
Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out www.cpumag.com/cpujan03/bios to see our entire upgrade list.

Motherboard	File (Date Available)	URL
ABIT AT7	at7c4.exe (10/11/2002)	www.abit.com.tw/abitweb/webjsp/english/download_content.jsp?pTITLE=AT7&#Bios
ABIT AT7-MAX2	at72b7.exe (09/09/2002)	www.abit.com.tw/abitweb/webjsp/english/download_content.jsp?pTITLE=AT7-MAX2&#Bios
ABIT BL7, BL7-RAID	bldw7bp.exe (09/16/2002)	www.abit.com.tw/abitweb/webjsp/english/download_content.jsp?pTITLE=BL7&#Bios
ABIT BW7, BW7-RAID	bldw7bp.exe (09/16/2002)	www.abit.com.tw/abitweb/webjsp/english/download_content.jsp?pTITLE=BW7&#Bios
ABIT IT7, IT7-MAX2	it7c6.exe (09/30/2002)	www.abit.com.tw/abitweb/webjsp/english/download_content.jsp?pTITLE=IT7&#Bios
ABIT IT7-MAX2 V2.0	it7pc7.exe (09/16/2002)	www.abit.com.tw/abitweb/webjsp/english/download_content.jsp?pTITLE=IT7-MAX2+V2.0&#Bios
ABIT KD7, KD7-RAID	kd7b8.exe (09/09/2002)	www.abit.com.tw/abitweb/webjsp/english/download_content.jsp?pTITLE=KD7&#Bios



Compiled by Steve Smith

R A W D A T A



Who does Jules Asner call when the Web connection goes down? She'll need a techie to make sure she doesn't miss an email from Freddie Prinze Jr. about getting together for lunch over two leaves of radicchio and lemon juice (which we hear passes for lunch in L.A.), and that techie could be you. The E! cable channel needs a network administrator to keep the dahlings in La-La Land well connected. According to the job description at E!'s Web site, you will "provide IT support through our LANs/WANs, including troubleshooting desktop applications, hardware and Inter/Intranet connectivity problems." OK, so you'll have to bone up on your NT, Novell, and Mac server skills and know your network protocols backward and forward. But think about it. You have access to everyone's PC on the network and handle troubleshooting the staff's desktops. You may not care that you can find out minutes ahead of time which bad fashion idea from the '70s is about to be recycled and overwhelm the nation's tragically hip for the next two days or so, but there's bound to be someone willing to pay for that information. ▲

3.15%

Percentage of U.S. computer users running the Mac OS.

RedSheriff

Predicted number of U.S. households with HD-capable displays by 2002. That number is forecasted to increase to 33.4 million in 2008.

Strategy Analytics

4.8 million

36.5%

Percentage of online population that speaks English.

Global Reach

69%

Percentage of U.S. college students who owned a cell phone in April 2002.

Harris Interactive

HORROR IN THE IT WORKPLACE

Stalking For Jobs

Quick tip for job hunters: Don't stalk your potential employer. Scott Testa, COO of intranet software provider MindBridge, arrived home early last summer only to be approached by a job candidate he had interviewed a week earlier. The man apparently spotted Testa in the company parking lot and followed him home to ask why he hadn't heard back. Not knowing exactly which way this bizarre encounter might turn, Testa acknowledged how much the

programmer wanted the job, "but for all intents and purposes, I told him to get the hell off my property."

No joke, says Testa, things are getting rough out there in IT jobland. "We're running into a lot stranger behavior than we did a year or two ago. The job market is just that tight and people are scared. People lived above their means." But tailing the COO of a company home

in order to do a follow-up in his driveway? "He probably could have picked a better way to catch my attention," says Testa.



Think you've got it worse? Share your true workplace horror stories with us at workwoes@cpumag.com

The Way PCs Ought To Be



HP just sent us a new Media Center PC 873n for WildTangent's WebDriver compatibility testing lab. I've been delaying my column in hopes of getting my hands on it, but alas, there is far too much to play with to do it justice before this column is due. I'll refer you to the www.hp.com Web site to get the full specs on it, but it's not the hardware specs that have me excited. Take a look at it; this is no beige office PC rehashed for the consumer market. The HP box looks like a home stereo system: The keyboard has knobs, buttons, and sliders that make it look more like a Yamaha synthesizer than an office appliance. The front panel is also covered with chrome stereo component-like elements.

What HP is doing here is something I believe is a very important step for the home computer. The basic uses for a PC have not evolved much since 1994, when a 90MHz 486 ran all your basic office applications as well as you could hope for. The only reason for upgrading since then has been to get the latest games and OS upgrades without hours of hassle and support calls. It's no wonder that PC prices and margins in the consumer market collapsed. More useless CPU power and RAM just aren't compelling reasons to buy a new PC by itself anymore.

The PC needs new applications, and those applications belong not in the office, but in the living room. In my opinion, there is no excuse for a modern consumer PC not to be a superior game console, PVR, and home stereo system. All consumer PCs should include these capabilities as standard functions. The HP Media Center includes a remote control; it has PVR software, a rich set of music options, and other great living room features provided by the newly introduced Windows XP Media Center Edition, a superset of Windows XP Professional. In principle, you can hook it up to a TV as easily as a PC monitor and use its media services via the remote control. This is an important step for the PC industry because it implies that a few of the leading

OEMs are starting to realize what the value proposition for the next-generation PC should be for consumers. There are, however, a few more important steps to be taken for consumer PCs to finally assume an identity of their own beyond the office environment.

I believe there is also an important distinction between consumer PCs that aspire to be great media creation and editing devices and PCs that aspire to be great consumer entertainment devices. There are some people who believe that the PC's highest aspiration should be to emulate a Macintosh and that what consumers want is the ability to do lots of media creation, like video editing. I'm sure there is a market for it, but overall, I doubt this kind of stuff is a mass-

market killer feature for next-generation PCs. Organizing and playing content is where it's at.

Video and audio are tertiary features of the PC; games are the PC's number one most important and highest value media type. GREAT support for gaming can never be an afterthought for the PC, especially one des-

tined for the living room. The 873n comes with a very respectable NVIDIA GeForce4 MX420 (64MB). The next step will be for all consumer PCs to have these capabilities and include at least Xbox-quality video capabilities and a gamepad. In fact, I wouldn't even ship a remote; a gamepad plus on-screen overlay menus can do the same job.

I want to give HP a thumbs-up for having such a compelling vision for future PCs. I hope to see a lot more of its product lines head in this direction.

Next month I'll compare the PC video architecture to the Xbox to show how a \$200 children's toy with 2-year-old video chip technology can almost always blow away the video performance of the most expensive high-end PC. ■

Email your thoughts to TheSaint@cpumag.com.

... there is no excuse for a modern consumer PC not to be a superior game console, PVR, and home stereo system.

Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chomeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is President and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

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EXTREME HARDWARE

These Gizmos Don't Sing It, They Bring It

It's a great winter to be snowed in but a terrible time to go snowblind. Spare your eyes the harsh glare of the tundra outside. The real show is in your living room with a glacier-sized wall of plasma from Samsung. If your significant other gives you the cold shoulder and puts your horror movie suggestion on ice, sled off to your PC room to watch your chiller in virtual 3D. Later, chill out with a frosty mug while you feed pics from your actively cooled digital camera into your flat-screen photo frame. How cool is that?

by Marty Sems



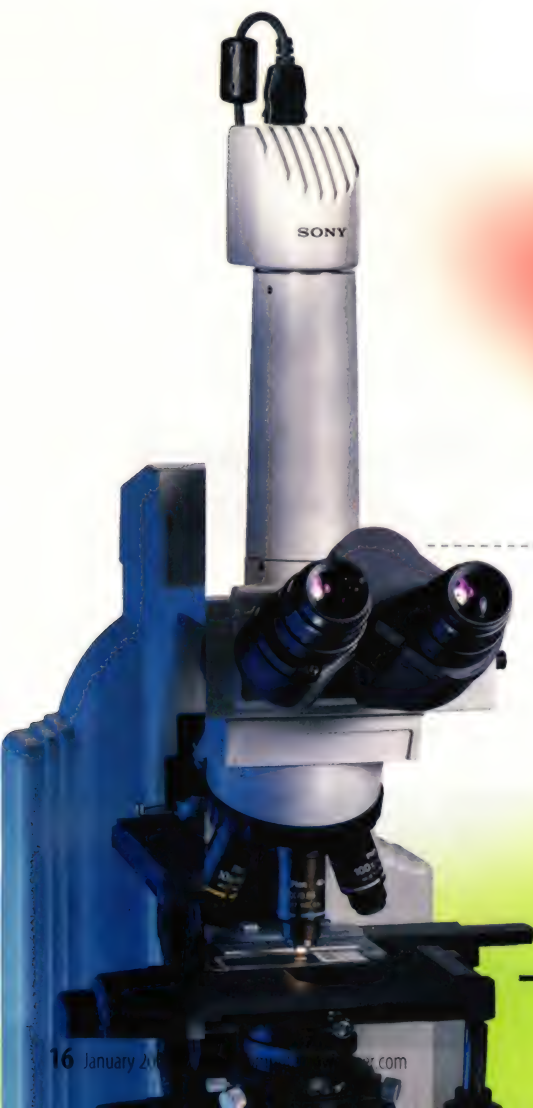
Mitsumi PC Mascot

No, the PC Mascot isn't a joke; it's too early for April Fool's gags, after all. However, you'll hear a lot of "lovely plumage" references when you connect Poll-E (\$69.95; www.pc-mascot.com) to your PC. Mitsumi Electronics Europe GmbH nailed this parrot to its perch and turned it into a USB email retrieval device. When you get new email through a complementary or existing POP3 account (sorry, Web-based email doesn't work with the PC Mascot, yet), Poll-E will let you know. He even can read it aloud for you with IBM's ViaVoice technology. This Norwegian Blue can move his wings, tail, beak, and head, plus learn phrases you teach him. He also can remind you of important dates and store your faux-British voice messages for others. Crikey, we hope someone sends Monty Python alumni John Cleese and Michael Palin each one of these. "Elloooo, Poll-E!"



Sony ICY-shot DXC-S500

Talk about cool pix. The shots this baby takes are as clear as ice. Sony takes a cue from the overclocking community to bring a cooled digital camera to the medical microscopy field. The \$5,995 ICY-shot DXC-S500's camera head unit uses a Peltier device to siphon heat away from its 5-megapixel CCD (<http://bssc.sel.sony.com>). Why bother? Because at 41 degrees F (5 degrees C), the CCD poses little danger of destroying the biological specimen under the microscope with its heat. A by-product of the cooling is a better signal-to-noise ratio, Sony says. This means there's the ghost of a chance that Peltiers could find their way into pro and prosumer digital cameras, as well, even if modders have to break the ice and put the first ones in themselves. And then tiny Plexiglas side panels, biohazard fan grills, and cold-cathode lighting, no doubt.



Pacific Digital MemoryFrame

Forget crowding clients around your digital camera's view screen to show them your project photos. And forget shoving a notebook with a WinXP slideshow across the conference table, too. Instead, smile enigmatically and direct your clients' eyes to your unassuming picture frame, which comes alive with the images you just took. Digital photography comes full circle with Pacific Digital's intriguing MemoryFrame (\$299; www.pacificdigital.com). It's the kind of photo frame we've been waiting for. It's a 5.6-inch TFT LCD that will play slideshows of more than 50 of your digital pics. Thankfully, it can download and arrange photos directly from your USB 1.1 camera or memory card reader without the need for a PC or notebook. The MemoryFrame's screen resolution is 640 x 480, and the device automatically scales larger photos to fit. The kicker? The hangable MemoryFrame fits inside standard 5- x 7-inch wooden photo frames, so you can blend it with its surroundings. Now you can make portraits with eyes that really do follow people around. (Pacific Digital, give us USB 2.0, a remote, and a high-res 8 x 10 version, and we'll give you Michael Sweet's firstborn.)



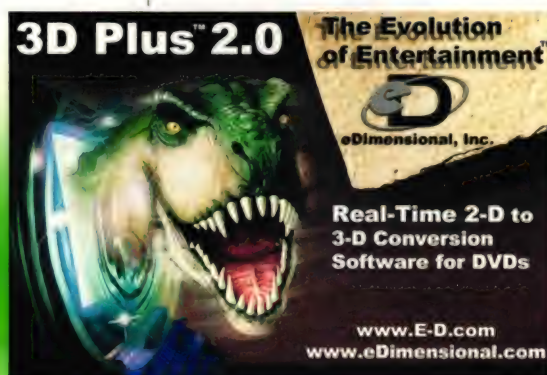
Samsung PPM63H1

It's colorful, flat, and worth about 18 grand. No, it isn't Iowa, although it's about the same size as Rhode Island. Samsung teased us nearly a year ago with a hint about its new 63-inch PPM63H1 plasma display (www.samsungusa.com/plasma). We never mind a bit of teasing, as long as there's a satisfactory resolution. And there is in this case: 1,366 x 768 pixels, along with six different aspect ratio modes and a 600:1 contrast ratio. This display can be a computer monitor, a TV, and an HDTV with support for digital TV modes up to 1,080i. Samsung has also announced samples of a 16:9 46-inch TFT LCD with 1,280 x 720 resolution and 800:1 contrast scheduled for production in the first half of 2003.



eDimensional 3DPlus 2.0

Even "Alien" creature designer H.R. Giger would get cold chills watching his creations unfold from slumber if only the movie series had been in 3D. And in 3D, Tom Cruise's Moab, Utah, rock-climbing sequence in "Mission: Impossible II" would have sent vertigo sufferers retching into their popcorn buckets. Now you can add the illusion of 3D to any of your favorite DVDs with eDimensional's new 3DPlus 2.0 software (\$49.95; www.edimensional.com), developed by Soft4D. Sure, we know this section is devoted to extreme hardware, but this time it's new software that makes eDimensional's already cool wireless E-D LCD shutter glasses for gaming (\$99.95) much more intriguing. With a decent CRT monitor, properly installed drivers, a moderate amount of tweaking, and perhaps eDimensional's excellent tech support, you can experience mild to wild visual thrills, depending upon the scene in the movie you're watching. 3DPlus can't quite offer the level of 3D postulated in "Minority Report," of course. Its codecs also could use some refinement. eDimensional says an upcoming patch should fix some of the issues we noticed. Still, you know where you'll find us for the next few weeks. We'll be ducking as Jean Reno's nose, er, .45 swings by in "Leon."



QUANTUM3D INDEPENDENCE

f you really want to get away from it all, immerse yourself in this: "A real jet fighter training mission should be hours of boredom punctuated by 18 seconds of excitement, and if you do end up in a dogfight, you've probably blown the mission because modern warfare is based on avoiding exactly the kinds of things that make games fun. . . ."

As co-founder of both 3D gaming graphics pioneer 3dfx and its spin-off, Visual Simulation and Training (VST) hardware leader Quantum3D (www.quantum3d.com), Ross Smith has spent enough time with captains, colonels, and generals to know, ". . . if you've done everything right, the enemy only knows you're there when they're dead."

Unlike earlier Quantum3D products that could take up to two years to engineer

a third-party consumer chip into a multichip board and a multiboard system, the massively parallel "4th generation" image generator (IG), Independence, is poised to take full advantage of merchant graphics innovations, such as programmable shaders, shortly after they hit your PC. Currently built with NVIDIA NV25GL Quadro technology, Quantum3D's Parallel Rendering Architecture (PRATM) uses precision hardware-based video and buffer swap synchronization technology to get multiple synchronized sub channel renderers (SR) working together on a per-pixel basis. A channel compositor then combines up to 16 dual Intel IA32/NV25GL-powered SR outputs to produce one 16 rotated grid sub-pixel sample anti-aliased, high-performance, low-latency, high-fidelity channel.

A full-blown Independence VST system, targeted at aviation mission rehearsal and precision flight training applications, may contain up to 32 channels and is managed by a server-class IG controller. Besides "out the window" views, Independence channels can be processed to simulate things like night vision and infrared. Because each SR is responsible for providing only a small fraction of each output pixel, if a chip or SR goes down in the middle of a 12-hour mission, the anti-aliasing quality drops in only that channel (i.e. from 16 sub-pixels to 15 subpixels), and the mission rehearsal can continue uninterrupted. "Technology Insertion" is the term that Quantum3D applies to Independence's

ability to incorporate new graphics technology into the system with relative ease and reasonable cost, which is a feature that has not been available in systems at this level before. But you can just call it upgrading.

In terms of throughput, Independence goes where no gaming system has gone before: An app that would send ATI's 9700 Pro howling for mama while scoring only 0.4 million independent triangles per second screams on Independence at a hefty 9.6 million.



Where the 9700 Pro could pull 20 megapixels per second fill rate, Independence pulls more than 2,500 megapixels. And, yes, they do get custom-tweaked drivers from NVIDIA. If you have to ask about system cost, you can't afford it, but just in case you work at Lockheed or Boeing, contact sales@quantum3d.com. **CPU**

by Joan Wood



Shuttle XPC SB51G Barebones PC

Most geeks I know (myself included) agree that "Star Wars" was brilliant, but the sequel "The Empire Strikes Back" was superior. Metaphorically speaking, the SS51G I reviewed a couple of months ago (page 18, November *CPU*) was also dead groovy, but this month, a new and feisty little number in the SB51G has been released, which, you guessed it, is even better.

Just like the SS51G, the SB51G dimensions are 7.24 inches high x 8 inches wide x 11.2 inches deep. Although the SB51G's aluminum exterior looks the same as the SS51G (except the bezel is brown instead of blue), the SB51G has been updated somewhat under the hood. For this racier model, the SiS-based platform has been replaced with a flex-ATX version (based on Shuttle's own FB51 motherboard) of Intel's newly released 845GE chipset. The 845GE is a perfect choice for the Pentium 4 and opens up the door to even better performance thanks to support for DDR333 memory, as well as Intel's faster P4s with HyperThreading technology (coming soon).

Hence, the XPC line has been given a bigger displacement in the engine department, if you will, which translates itself into faster benchmarks and a PC that would not look too much out of place at a hardcore LAN party where beefy PCs are the order of the day. In fact, pop in an ATI Radeon 9700 PRO and a Pentium 4 2.8GHz, and Quake III screams at 287fps, while Serious Sam: TSE chimes in at 113fps. Very impressive. If you're not into gaming and are considering the SB51G for corporate use only, the on-board Intel Extreme graphics do the job of running Windows alright (but that's integrated graphics for you). You might get strange looks from your IT manager, though. . . .

Despite its small demeanor, the SB51G is jam-packed with goodies, including on-board 5.1 sound and 10/100 LAN courtesy of Realtek. You can add as much as 2GB of PC1600/2100/2700 DDR memory in its two slots, and there is enough room for a couple of 3.25-inch hard drives that slot snugly into the removable hard drive unit. A 5.25-inch media bay is available up front for all your CD/CD-RW/DVD/

DVD-RW needs, as are a plethora of I/O ports, including FireWire, USB 2.0, and SPDIF in (although SPDIF out is curiously located a la derrière of the case). In addition to the AGP port (4X, not 8X), there is a single PCI slot, should you find the need for it.

Shuttle's I.C.E. Technology cools your processor quietly and efficiently using heat pipes and an exhaust fan, so there's no need for adding a noisy CPU fan/heatsink combo. In terms of noise reduction, it's like comparing the inside of a Lexus at 100mph to a 1970s muscle car at the same speed. The SB51G kinda sorta comes fully loaded with airbags like a Lexus, too, with the motherboard controlling the fan's speed based on feedback from its thermal sensors, so your CPU is safe and sound. The heatsink itself is easy to install and remove via a retention mechanism, no screwdrivers necessary.

The level of tweaking available in the BIOS isn't quite up to snuff compared with Shuttle's mainboard-solo products, but that's probably to be expected. I wouldn't fancy your chances at overclocking to high hell safely in an environment with a single exhaust fan and heat pipe, anyway. You can still adjust memory timings and dabble with FSB speeds in 1MHz increments, so there could be a little bit of leeway where overclocking is concerned.

If you're looking for a LAN party box or are just tired of those noisy large boxes, then SB51G certainly fits the bill without sacrificing on performance. All that's missing is AGP 8X and ATA/133 support, but because those technologies talk the talk rather than walk the walk, even high-end users are learning to live without them currently. Anything else to stop you? The upcoming release of an nForce2-based XPC for the AMD Athlon XP is just around the corner. . . . ▲

by Alex "Sharky" Ross



XPC SB51G Barebones PC

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XPC Barebones Benchmarks

	SB51G	SS51G
3DMark 2001 Default	12835	11307
Quake III	287	255
Comanche 4 Default	50	48
Serious Sam TSE	113	102

Tested on a WinXP Pro with P4 2.53GHz

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Intel Pentium 4 3.06GHz



Pentium 4 3.06GHz

\$637/1,000 units

Intel

(800) 628-8686

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www.intel.com



Intel's most recent roadmaps had surprisingly promised a 3GHz part before the close of 2002, thanks to better than expected Northwood yields. Intel has broken the 3GHz barrier its newest Pentium 4, the 3.06GHz. As an added bonus, this processor will be the first in a long line that supports Hyper-Threading.

On the surface, this P4 looks much like any other Northwood. It's still based on a 0.13-micron process (although Intel's 90nm process is apparently going well), sports a quad pumped 133MHz FSB (effectively 533MHz), and actually harbors the same <5% worth of die space devoted to Hyper-Threading that previous P4s had. The difference now is that Hyper-Threading is being "enabled" with a simple BIOS update and using Intel's newest set of 533MHz FSB platforms. SiS and VIA have yet to officially announce support for HT,

and no BIOS updates have been released, but it's highly likely that the situation will change. Intel has claimed that this 5% of die space reserved for HT can, in fully optimized situations, increase performance by 30%.

If you've been following the CPU wars, you'll remember that despite Intel's clear MHz victory over AMD, the P4's 20 stage deep pipeline was actually a weakness when it came to comparative performance where IPC (instructions per clock) is concerned. Hence, clock for clock, AMD actually held a lead; it's just that the P4 architecture is so much more scaleable that Intel has attained higher frequencies. Hyper-Threading tackles the IPC problem by taking a single P4 and turning it into an SMT (symmetric multithreading) animal, making a single processor act like a dual CPU setup, keeping the single P4's execution pipelines constantly at work. Caches, registers, and

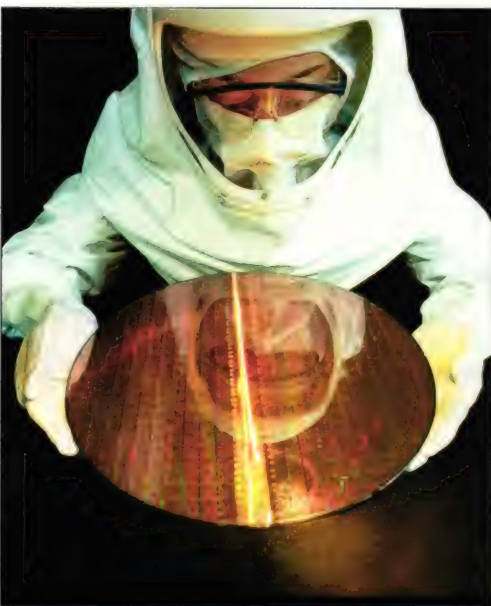
execution units are dynamically shared, particularly the execution units, where all the integer, floating point calculations are moved to and from memory. These execution units are typically hard to keep fully fed all the time, but HT addresses the problem. At least OSes like Windows XP and Linux (Kernel versions 2.4.18+) treat the P4 3.06GHz so.

But before you rush out to replace your 2.8GHz P4, ACHTUNG!, don't. At least, don't spend the cash because your "old" CPU isn't HT-enabled. Right now it's so not worth it. Those of you with much older CPUs looking at a fast P4 upgrade, however, can really focus in on the fact that 3GHz is going to give you screeching performance, but don't expect HT to provide miracles. It won't speed up Quake III (SMP support is broken in it), nor will it turn your annoying neighbor into a goat. You're getting early technology that will someday prove its worth, just not quite yet.

And when all your favorite killer apps begin to support HT, the real fruits of this new P4 will begin to ripen. But you can ask Harry Potter when this will actually occur: As with all new technology, it's got to start somewhere, so expect it to take awhile to really take off. In the meantime, you can practice showing off your HT skills by playing Unreal Tournament and encoding DivX movies at the same time. Your girl/boyfriend will be singularly impressed by your HT P4.

For now, we're left with a very zippy P4. In non-HT enabled benchmarks (let's face it; that's what most of us will find ourselves using in this situation), the 3.06GHz nips past the Athlon XP 2800+. But as always with new Intel CPUs, the price of admission isn't exactly Happy Meal-cheap; it's more ritzy, overpriced French restaurant-like at \$637 for 1,000 units. But unlike the Athlon XP 2800+, the P4 3.06GHz is actually available now. Things could get even more exciting when not only the P4 HT's clock speed is raised but when it's coupled with Intel's Granite Bay Dual-DDR chipset later on in 2003. For now, you can gain the best performance with the new i850E chipset paired with PC1066 RDRAM. ▲

by Alex "Sharky" Ross



P4 3.06GHz Benchmarks

	P4 3.06GHz	Athlon XP 2800+
Unreal Tournament 2003	195	190
Jedi Knight II	175	161
Comanche 4	60	53
3DMark 2002	15390	14557

Tested on a WinXP Pro

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

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MSI GF4Ti4200

MSI's GF4Ti4200 card is a sweet-looking board with analog and DVI monitor support. But when push comes to shove, the card's performance lags behind similarly equipped video cards.

The GF4Ti 4200 uses NVIDIA's popular GeForce4 Ti 4200 GPU. The GF4Ti4200 has 128MB of DDR SDRAM, although the extra memory doesn't seem to add to the card's performance. I've tested a few Ti 4200-based cards with only 64MB of RAM that outperformed this offering from MSI. The card has the usual specs: support for DirectX and OpenGL, a max resolution of 2,048 x 1,536, and refresh rates from 60Hz to 150Hz. The card is compatible with Win9X/NT/Me/2000/XP.

I expected a little more from the GF4Ti4200. I would have thought that the card could have at least kept up with other Ti 4200 cards, but that wasn't the case. The GF4Ti4200's 3DMark2001 score was only 8,818; that's about 100 points lower than similar cards I've reviewed recently.

The GF4Ti4200's Quake III scores weren't bad, but again they were generally lower than Ti 4200 cards from other manufacturers. The card's frame rate in our Quake III demo (running at 800 x 600) was 198.7fps. This is adequate, but most Ti 4200 cards top 200fps at this resolution. At 1,024 x 768, the card's frame rate dipped a bit to 188.6fps. But the frame rate went into a free fall at 1,600 x 1,200, down to only 112.6fps.

The Serious Sam demo results were also disappointing. The card managed a frame rate of 71.6fps at 1,600 x 1,200 when running the Karnak demo. Most Ti 4200 cards average about 80fps in our tests. The Metropolis demo wasn't much better, with the GF4Ti4200 scoring a frame rate of 78.8fps. Again, the GF4Ti4200 was about 8fps to 10fps behind the competition.

With so many good (and affordable) GeForce4 Ti 4200 cards on the market, it's hard to justify picking this one ahead of the rest. ▲

by Michael Sweet

Gigabyte Maya R9000 PRO

Gigabyte just released a fancy new video card based on the Radeon 9700 GPU, and it's a doozy. However, it's also more than \$350, and not all of us are gonna fork over that much jack for a video card. Hey, some of us have bills, and we'd still like to buy some groceries, too, you know?

Gigabyte also recently released a new Radeon-based card for the more budget-minded user: the Maya R9000 PRO.

The Maya R9000 PRO is based on a Radeon 9000 GPU, which is the best GPU for sub-\$100 video cards. The Maya R9000 PRO has 64MB of DDR SDRAM and supports more DirectX features than similarly priced GeForce4 MX video cards. The card has refresh rates from 60Hz to 200Hz and is compatible with the Win98/NT 4.0/Me/2000/XP OSes.

The Maya R9000 PRO is about average as far as Radeon 9000-based video cards go. Its 3DMark2001 score was a respectable 7,065:

not eye-popping in the greater world of video card accomplishments, but it's a good score considering the card's price category.

The Quake III scores also were decent, with a frame rate of 198.2fps at 800 x 600 and 164.1 at 1,024 x 768. The frame rate took a precipitous tumble at a resolution of 1,600 x 1,200 to a frame rate of only 73.9fps. The Maya R9000 PRO results from the Serious Sam demo were perhaps a notch or two above average. The card's frame rate during the Karnak demo was 54.9fps, and the Metropolis demo frame rate was 64.1. Not bad for a budget card. Not bad at all.

Gigabyte's Maya R9000 PRO really isn't any better than ATI's Radeon 9000 offering, but it isn't any worse either. If you're looking for a budget card, you'll definitely want one that uses the Radeon 9000 chip. If you have to choose between ATI and Gigabyte, pick whichever one's on sale. ▲

by Michael Sweet



GF4Ti4200

\$175

MSI

(626) 913-0828

www.msicomputer.com



Maya R9000 PRO

\$92

Gigabyte

(626) 854-9338

www.giga-byte.com



Gigabyte Maya II

Gamers and hard-core PC users young and old were about to burst with anticipation when ATI released its spiffy new Radeon 9700 GPU. ATI believes in sharing (for a price), so we're just now starting to see other brands come to market sporting the Radeon 9700. Gigabyte wrapped up the Radeon 9700 in a product it calls Maya II, and it's a delicious video card.

The Maya II has 128MB of DDR-SDRAM and AGP 8X support, so start shopping for a new 8X enabled motherboard, boys and girls. The card is compatible with all of the major OSes, including Win98/NT 4.0/Me/2000/XP, and has a typical range of refresh rates from 60Hz to 200Hz. Of course, the card supports the latest versions of DirectX and OpenGL.

Maya II got my attention in every test, but the 3DMark2001 score was the number I really noticed. The card ponied up a total score of 11,033, which is by far the fastest I've seen on our aging video test machine. This card really breathed new life into our creaky test system.

I checked out Quake III next. The frame rates from the first two demos we ran were about average. The card maintained a frame rate of 198fps at 800 x 600 and 196fps at 1,024 x 768. However, I was thoroughly impressed with the card's frame rate at 1,600 x 1,200. Maya II kept the game humming at 175.1fps, whereas the frame rates for most video cards drop into the abyss like some sucker on "Celebrity Fear Factor."

Maya II made a pretty good showing in the Serious Sam demos we ran, as well, averaging a frame rate of 78.6fps during the Karnak demo and 94.1fps during the Metropolis demo. The game looked gorgeous and played better than ever at high resolutions.

It's no wonder there's so much excitement about the Radeon 9700 GPU. It's simply fantastic, and Gigabyte knows how to use it. The Maya II tops NVIDIA's Ti 4600 various incarnations, for now. ▲

by Michael Sweet



Maya II

\$370

Gigabyte

(626) 854-9338

www.giga-byte.com



Hitachi CML190B

Although it falters now and then, Hitachi's reputation for quality shows up big-time in its new CML190B, a 19-inch dual-input (analog/digital) LCD. Hitachi is rightly proud of its latest LCD child; the CML190B is among the few flat-panel displays that Hitachi's Web site lists as being good for everything, including desktop publishing, CAD/CAM, word processing, general use, and document imaging.

Even with a colossal screen (it provides almost as much on-screen real estate as a 21-inch CRT), the 14-pound CML190B leaves a small oval footprint with a mere 3-inch depth. The case is black (thus the "B" in CML190B) and sports a thin bezel, which gives the impression that the screen is even larger than it is.

I tested the display at its optimal 1,280 x 1,024 resolution with a 75Hz refresh rate using analog input. The display had fast response times, so 3D games looked as good as they would on a high-end CRT. The display has a 0.294 pixel pitch, which is good but not as low

as they come. But still, the display handled every imaging task I threw at it with ultra-sharp clarity.

I used DisplayMate's Multimedia Edition software for diagnostic testing, and the CML190B responded beautifully to every test screen. Tests for white-level regulation showed that the display is capable of accurately rendering sharp, high-contrast images. Color scale and grayscale test screens revealed the display's even-keel balance of light and dark shades.

High-resolution digital photos in Adobe Photoshop appeared incredibly vivid, and text remained sharp regardless of the font, size, or display resolution. If you can part with \$1,000 or so (the display is available online for less than its MSRP) and can do without bells and whistles, such as integrated speakers and a TV tuner, the CML190B is astonishingly good. ▲

by Cal Clinchard



CML190B

\$1,199

Hitachi

(800) 441-4832

(781) 461-8300

www.hitachidisplays.com



Seagate Barracuda ATA V 120GB



Barracuda ATA V 120GB

\$185

Seagate

(800) 732-4283

(831) 438-6550

www.seagate.com



Boasting a new and improved SoftSonic FDB (fluid dynamic bearing) motor and 60GB platters, Seagate's recent Barracuda ATA V 120GB seems to be an 80GB ATA IV with denser data storage. Its excellent 350G non-operating 2ms shock tolerance and near-silent acoustic ratings (2.5dB idle; 2.8-3.3dB seeking) are identical to the ATA IV's. Its Winbench99 scores, however, are top-notch.

This is the ST3120023A model; look for an "S" on the end to denote Serial ATA 150MBps versions. The SATA edition also has an 8MB cache instead of this drive's 2MB buffer. Besides giving tomorrow's hard drives a chance to attain higher read/write speeds than today's 100MBps and 133MBps parallel ATA interfaces, SATA 150 will offer thinner data cables and sundry technical benefits. Expect to see new hard drives in both SATA and ATA forms for at least the next few years.

According to HD Tach, the ATA V's performance falls near last year's ATA IV. On a 1.8GHz P4 system with 256MB of PC800 Rambus and WinXP Pro, the ATA V hit an average read rate of 36.5MBps (44.7MBps maximum) and an average write rate of 20.2MBps (26.5MBps maximum). It logged a best random-access time of 13.3ms in two test sessions. Winbench99 places the drive behind only the 80GB Caviar WD800JB with 8MB cache in Business Disk (8,330KBps) and ahead of all competitors in the High-End Disk test (28,600KBps). In short, the Barracuda ATA V demonstrated an aptitude for real-world I/O demands that outpaced my expectations, judging by its more moderate read/write rates.

Seagate's pricing department says the 120GB's official price is \$185, but you already know you'll find it much cheaper online. ▲

by Marty Sems

Archos Jukebox Recorder 20



Jukebox Recorder 20

\$279.95

Archos

(949) 609-1400

www.archos.com



With a 20GB hard drive, Archos' newest portable MP3 player/recorder packs more storage space than most MP3 players, but the Jukebox Recorder 20 pays for its hard drive in size and weight. At 4.5 x 3.2 x 1.3 inches and weighing 12.3 ounces, it is bulkier than most PDAs.

On the other hand, you can't store 20GB of digital music on your PDA. Although the Jukebox Recorder is probably too boxy and heavy to comfortably strap on your arm and take for a run, it makes a good travel companion. Archos ships a small belt pouch with the Jukebox Recorder that keeps it reasonably snug against your hip as you walk. The Jukebox Recorder also includes a pair of collapsible headphones, a USB 2.0 cable, and a cable that lets you rip MP3s from your stereo.

The Jukebox Recorder uses MusicMatch Jukebox to rip MP3s. You can also load a copy of MusicMatch onto your computer. MusicMatch lets you rip MP3s from your CD-ROM and (if you have a CD burner) burn

songs onto CDs. MusicMatch will connect to the online CDDb (Compact Disc Database) and automatically insert the appropriate song titles into your MP3s' file names. To transfer MP3s from your computer to the Jukebox Recorder, simply connect the two via the USB cord, then copy and paste the MP3s to the Jukebox Recorder.

You can also organize your MP3s from the Jukebox Recorder itself. The bare-bones Jukebox OS lets you create folders on the hard drive so you won't have to scroll through a list of 3,000 song titles. You can also edit MP3 file names and adjust sound quality controls (such as bass, treble, and balance).

The Jukebox Recorder isn't pocket friendly, but it has plenty of features, and you won't need deep pockets to make one your own. At \$279.95, I would choose it over the sleeker but pricey (\$499) Windows-compatible, 20GB iPod. ▲

by Joshua Gulick

First International Digital irock! 530

The First International Digital irock! 530 is one of the lightest MP3 players you will find. Although this player's MSRP is a whopping \$179, you can find the irock! 530 for about \$130 at most locations, including the company's Web site.

A lightweight MP3 player is generally a good thing because it lets you transport a lot of music without carrying a lot of bulk. However, a word of caution: The first testing unit I received was damaged in the mail. I suspect this had something to do with the 530's light, plastic design. However, to be fair, after receiving the second testing unit, it held up well, even when I transported it in my notebook computer's case. If you invest in this device, just be aware that it may need a little extra love and care.

The irock! 530 produces surprisingly good sound quality and includes equalizer, bass, and mode settings. Also, the one AAA alkaline battery lasted longer than I expected. The

installation CD has several applications, including the irock! Audio Manager, a program that lets you create MP3 playlists and transfer them to your irock! device. I found this program difficult to use, though. When I used it to search for audio files, it listed not only MP3s but also Windows system sounds.

Creating playlists was also tricky without the assistance of the users manual (located on the installation CD). You can buy a SmartMedia card for the 530's SmartMedia slot, which will let you dramatically increase the player's storage capacity.

You'll have to be careful not to damage the 530 because of its plastic casing. However, once I got past that and the problems with the Audio Manager software, I did enjoy using the irock! 530, which has greater storage capacity than most players of this size and price. ▲

by Kylee Dickey



irock! 530

\$179

First International Digital

(847) 202-1900

www.myirock.com



Plextor Plexwriter 48/24/48A

I'll admit that I didn't care for the idea of a default read speed reduction when I first encountered it in the Sony 48X/12X/48X CRX210A1. And SpeedRead—Plextor's curious name for the feature that lets you increase CD read speed from 40X to the drive's advertised 48X—seems like a shady spin to divert your attention from the 40X default speed. Unfortunately, reduced read speed beats an expensive game CD flying into pieces any day. And yes, it can happen—Plextor has photos.

The problem is that commercial CD-ROMs with pressed aluminum recorded layers are sometimes less balanced than dye-based CD-Rs and CD-RWs and thus have a lower rpm threshold. 48X read speed correlates to 9,600rpm, too close to the redline for typical CD-ROMs. Even your favorite CD-Rs can develop tiny cracks in their inner diameters, which put them at risk at high speeds. Plextor even reinforced this drive's bezel to protect you from shrapnel if one of your discs does fragment. You *can* force this Plexwriter to read at 48X by pressing the

Eject button for three seconds before you insert each disc, if you prefer.

Other innovations include PoweRec media sensing, a new self-test procedure, Mt. Rainier support, and a new stepper motor to improve the drive's access times (60ms random and 115ms full-stroke accesses in our tests). Another technology, VariRec, lets you adjust the intensity of the writing laser at CD-R burn speeds up to 4X. If you make a disc that doesn't play back correctly in some devices, choose another of five laser intensities to see if subsequent discs work better.

This innovative Plextor burned a 700MB CD-R in 3:59 and a 639MB CD-RW in 4:06. It includes unlimited toll-free tech support and has a 1-year warranty. ▲

by Marty Sems



Plexwriter 48/24/48A

\$149 white; \$159 black

Plextor

(800) 886-3935

(510) 440-2000

www.plextor.com



Kodak Professional 8500 Digital Photo Printer



Professional 8500 Digital Photo Printer

\$1,095

Eastman Kodak

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(716) 726-7260

www.kodak.com



When you catch the photo bug, and I mean *really* catch the photo bug, it's hard to stop buying the latest and greatest gear for both capturing and printing your images. If you've been lusting for an affordable dye-sub printer to help you produce lab-quality photos, the 8500 Digital Photo Printer may be your ticket.

This is an expensive but powerful printer that creates 8- x 10-inch photos in just more than a minute. Not to ruin suspense so early in this review, but the final photos are excellent, with the smooth color transitions and fine detail I saw with a similar (but more consumer-oriented) product, the Olympus P-400.

Unlike that P-400, the 8500 doesn't come with flash memory card slots or an LCD screen to let you tweak your photos on the printer. What's more, the 8500's driver is sparse and not at all geared toward novices; you will need to understand the details of photo printing to avoid making lots of "test" prints that will consume copious amounts of expensive paper and dye (prints cost about \$1.80 each).

My tests went smoothly, for the most part. A loose ribbon initially caused colored streaks, but I tightened up the ribbon to eliminate the problem. I twiddled the color profile settings for about an hour, and after initially seeing some bland-looking colors, my final prints looked luxurious.

The 8500's prints should last, although Kodak reveals some interesting test results in its online specs: The 8500's prints showed barely noticeable fading in magenta shades, while prints from an Epson inkjet showed no fading at all. But although the 8500's images displayed excellent water resistance, Epson's shots showed evident degradation. Ink might not be such an amateurish choice after all, huh?

Whether you really need the kind of printing power the 8500 offers is a matter of priorities. Of course, if you really have the bug, the hefty but not insurmountable price on this one probably won't stop you. ▲

by Nathan Chandler

HP PhotoSmart 7550 Photo Printer



HP PhotoSmart 7550

\$400

Hewlett-Packard

(800) 752-0900

(650) 857-1501

www.hp.com



The world does not need another overpriced photo printer. The world does not need the HP PhotoSmart 7550.

Is that poetry? It might as well be. Those two ham-handed opening lines are about as poetic as photos

from the \$400 7550. The images I printed using this HP weren't crystal clear, had only so-so color quality for a printer that touts its seven-color printing system, and worked with speeds that only a turtle with a sprained knee would appreciate.

I was initially intrigued by the 7550's specs, with its unique seven-color system, direct-photo printing abilities, and a built-in LCD screen for on-printer editing. But none of these features overcame the printer's lack of execution concerning its primary task: photo printing.

The 7550 needed the better part of five minutes to complete my 8- x 10-inch test photo. That's no travesty—just ask Epson's sluggish

printers. But this is a \$400 product, and its final photos aren't even as nice as Epson's \$99 820. In fact, Canon's new inkjets cost half as much, printed the same photo in only about 60 seconds, and also had better print quality.

While I have the 7550 on the ropes, I'll administer the crushing gut-punch: This HP's prints smear on some HP papers. I initially thought it was an aberration, but after double-checking some settings and running my finger across several prints, there was no doubt. You would need to immediately frame glossy prints from this puppy to keep guests from handling, and thus ruining, your photos.

The 7550 does a nice job with text and clip art (most inkjets do), but this printer's mission was to create high-quality photos conveniently and quickly. It succeeds on the convenience factor but falls short on the speed and quality counts. Spend your money elsewhere. ▲

by Nathan Chandler

Toshiba PDR-2300

From its floppy, poorly fitted port covers to its slow, jerky zoom, the PDR-2300 from Toshiba screams “budget-priced.” Of course, that’s the gist of cheaper cameras—they work, but they’re not pretty and won’t necessarily inspire you to take a gazillion pictures.

To Toshiba’s credit, you’ll probably at least be getting your money’s worth with this camera. It features a 2-megapixel sensor and 3X optical zoom, 8MB of onboard memory, and a slot for SD cards (up to 256MB capacity).

I was less than pleased with the grainy LCD monitor, as it had a lot of lag and was almost impossible to see in moderate daylight. The zoom lens, as I’ve already mentioned, could be better but is certainly better than no optical zoom at all. Plus, you can add a number of optional lenses to the PDR-2300, a fact that increases its value considerably.

Performance-wise, this is an adequate camera. Startup times weighed in at about six seconds,

and shot-to-shot times were about five seconds when I used the flash. I was disappointed (but not surprised) by the lack of manual controls, as a few basic settings might’ve helped me fix a few shots.

The images I took under fluorescent lights came back with a bluish tint using the auto white balance. There was some noticeable noise, and I did see a few minor aberrations, but neither of these was particularly distracting. My eyes found greater dislike for the barrel distortion that warped a lot of photos that were otherwise good.

I won’t say this is an awful product for the price, but cameras like this remind me why I saved my money for one that cost about 100 bucks more. You’ll be happier in the long run if you do the same. ▲

by Nathan Chandler



PDR-2300

\$229.99

Toshiba

(800) 550-8674

(949) 583-3000

www.toshiba.com



Nikon Coolpix 4300

I don’t envy digicam makers. Every day they have to figure out a new way to make their products more affordable while simultaneously adding newer and better features. Somehow Nikon manages this feat with most of its products.

The Coolpix 4300 isn’t the perfect sub-\$500 camera, but it’s certainly a good value. The camera includes a 4-megapixel CCD and 3X optical zoom capabilities, along with plenty of auto and manual controls. Power works through the rechargeable lithium-ion battery, which you can keep tabs on using the indicator on the lush, clear 1.5-inch color monitor.

In product literature, the 4300’s size is misleading. What appeared to be a fairly large camera was actually just a little too big to fit into my pocket. Cramming all that high-tech stuff into such cramped quarters seems to have slowed this camera down, though. Startup times were about five seconds, and with the flash on, the delay between shots was nearly eight seconds.

Images were excellent, featuring accurate color and few aberrations. The CCD was obviously top-notch, snagging beautiful, minute details in a lot of my test pictures.

For a midpriced camera, there are a lot of ways to play, from the 12 preprogrammed scene modes to the plethora of manual controls. You can control four metering modes, and you have a lot of power over shutter and aperture settings, too. The Bulb mode works up to 60 seconds and engages the noise reduction technology. I also liked the white balance bracketing and the option to add external lenses.

Some of the camera’s controls are a bit convoluted—you’ll no doubt have to scan the manual a few times before you feel comfortable. But as it turned out, the slow-charging flash is probably this camera’s biggest weakness. Advanced amateurs who don’t mind slightly sluggish performance should enjoy this one. ▲

by Nathan Chandler



Coolpix 4300

\$499

Nikon

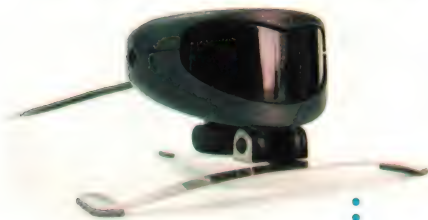
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(631) 547-4200

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Eye Control Technologies NaturalPoint *Smart-Nav* AT



NaturalPoint *Smart-Nav* AT

\$299

Eye Control Technologies

(541) 753-6645

www.naturalpoint.com



The concept of Eye Control Technologies' NaturalPoint *Smart-Nav* is simple: Move your head to control the pointer and assign keyboard keys to act as mouse buttons.

You can mount the *Smart-Nav* on top of a monitor or hook it over a notebook screen. Stick one of the bundled adhesive, reflective dots to your forehead, and the *Smart-Nav* bounces an IR signal off the dot to track head movements. You can buy 40 replacement dots for \$6. The *Smart-Nav* has a short USB cable for convenient notebook usage and also bundles an extension cable.

Controlling the pointer doesn't come naturally; expect quite a learning curve. Adjusting the Smoothness and Speed settings help, but you must still hold your head steady to keep the pointer over an icon while reaching for the keyboard. Also, if you glance away from the monitor to read material that you're transcribing, you'll have to recalibrate (center) the pointer.

The Gravity feature makes the pointer jump to and lock on nearby icons and hyperlinks. Sometimes, though, the pointer gravitates toward and sticks to the wrong objects. Dwell Clicking clicks an item the pointer hovers over. I had to turn this feature off when browsing the Web because it kept clicking banner ads.

This model includes such accessories as a Y-cable and dot rings (to control the pointer with your finger). The EG (Ergonomics) model for \$199 lacks such features as Gravity and Dwell Clicking. However, the *Smart-Nav* EG adds a carrying case and a wand-pointing device. The base model (\$129) includes only the basic features, an extension cable, and dots.

The human head is too heavy to hold steady, so the average user shouldn't dump that mouse for a *Smart-Nav* just yet. However, if you suffer from a condition that rules out mouse usage, the *Smart-Nav* might be an option. ▲

by Kylee Dickey

Koolance EXOS



EXOS

\$270

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(253) 839-8999

www.koolance.com



Those of you into overclocking are probably adept at adjusting the FSB, joining L1 bridges with a pencil, and opting for a top-of-the-line HSF combo or what not. Some of us want more. Enter the overclocker water-cooling crowd. The DIY setup of overclocking with H2O isn't for the faint-hearted, however. Koolance offers ready-made bare-bones systems that feature water cooling ready to go (for a price). But there's another craze going on right now: case modding. Want to mesh the two? If you're happy with your current case but want to dabble with water cooling, Koolance's external EXOS water-cooling system may fill the bill.

The EXOS system sports all the gizmos required for fancy H2O cooling in a "set-top" box, which sits on top of your PC and requires no mods. The external chassis itself includes the top-cooling module with fans, radiator, reservoir, pumps, and nifty LED display. There is also a power control board with a slot interface, quick release valves, a liquid coolant bottle, funnel, external/internal tubing, attachment strips/pads,

a bottle of ethylene glycol for mixing with distilled H2O, and an easy-to-understand manual.

The review unit also came with Koolance's CPU-200G water block, a copper-based unit that's gold-plated and rated for 200W of heat dissipation. The CPU-200G is compatible with socket 478 Pentium 4s, socket 370 Pentium IIIs, and any Athlon XP, thanks to its ratchet design retention mechanism. Once underway, the whole setup not only benefits from "overclocking" but is also quieter than your bog-standard PC. The EXOS sports three 80mm exhaust fans, which expel air, while side vents act as cold air intakes. You can control the fans manually or automatically via a temperature probe.

At \$270, the EXOS isn't cheap, but being an external solution means you can use it with your next homemade system. Not only does it look sleek, but if you're a novice, the system is currently your best bet for getting into water cooling without causing any injury to yourself. . . . ▲

by Alex "Sharky" Ross

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Logitech MX700 Cordless Optical Mouse

Logitech uses words such as Cruise Control and Optical Engine to describe its MX Series mice. I took the MX700 Cordless Optical Mouse for a spin to cut through the fancy Logitech speak to see how this mouse really performs.

For starters, the MX700's RF-signal receiver doubles as a charging station. You don't need to remove the two rechargeable AA NiMH batteries; simply place the mouse in the receiver's cradle at any time. An AC adapter plugs into the bundled USB cable to power the receiver-charger combo.

The MX700 is the only optical mouse I've tested that performed perfectly on the semi-glossy surface I use to test the limits of optical sensors. The MX700 also has fast report rates, an impressive feat considering the transmission lag time cordless mice experience. Logitech says the MX700 transmits data at the same rate as a USB connection. As far as I could tell, the claim is valid. Gamers especially should rejoice: A cordless mouse with no lag time!

The eight-button MX700 includes a few unique buttons. The two Cruise Control buttons let you scroll by pressing just one button. Click the Quick Switch button for a drop-down list of all open windows for easy toggling between applications. The Forward and Back buttons let you navigate Web browser and Windows Explorer windows.

Now for the cons: Although you can program one of 50 functions for each of the eight buttons, you cannot assign application-specific functions. A left-handed MX700 model would also be nice. It's a shame that left-handed users must go for the corded MX300 instead of the cordless MX700. Finally, at \$79.95, the MX700 isn't cheap.

Although the price is high for the average consumer, it isn't unreasonable for the user who demands extra buttons, rechargeable batteries, accurate tracking, and fast transmission speeds. ▲

by Kylee Dickey



MX700 Cordless Optical Mouse

\$79.95

Logitech

(800) 231-7717

(510) 795-8500

www.logitech.com



Microsoft Optical Mouse Blue

Remember the backlash against beige computers? Now, it seems, there is also a backlash against beige and gray mice. For instance, compared to last year's Microsoft mice, the new Optical Mouse Blue has just one significant change: its color. Is this mouse worth the money, or is it merely a splash of color?

This mouse bundles Microsoft's IntelliPoint 4.1 mouse utility, which lets you program each of the mouse's three buttons with one of 38 functions. You can also enable the program-specific Button Settings feature, letting you assign different button functions for different programs. The amount of programming you can actually do, however, is limited. For instance, I wanted to create a Back shortcut for Internet Explorer, but I hesitated to reassign either the right or scroll buttons. I use these buttons regularly in IE.

I also wish the Keystroke function gave users a little more freedom. You can only add one keystroke after the modifiers (ALT, CTRL, and

SHIFT), so although you can create a mouse-button shortcut for ALT-F, you cannot create one for ALT-F-A.

Although 2002's Optical Mouse Blue incorporates more aesthetic than functional improvements, I can't find any reason to fault this mouse's performance. The Optical Mouse Blue performed at an almost flawless level, even when placed on a semiglossy (and usually problematic) surface. I was equally pleased with the mouse's ergonomics. The mouse is ambidextrous and sloped to fit the curve of a user's hand.

I thought I would sing the blues about this mouse's blue color. That is because there is a stubborn part of me that would like to fault Microsoft for releasing a mouse that functions at the same level as last year's mice. However, the Optical Mouse Blue is one of the best-performing and most comfortable optical mice I've tested in the last year. ▲

by Kylee Dickey



Optical Mouse Blue

\$34.95

Microsoft

(800) 426-9400

www.microsoft.com/mouse



Panasonic Toughbook 72



Toughbook 72

\$3,932

Panasonic

(800) 662-3537

(201) 271-3182

www.panasonic.com/computer/notebook



Features

Processor:
1.6GHz Pentium
4-M

RAM:
256MB/768MB

Hard Drive:
30GB

Optical Drive:
DVD/CD-RW

Connectivity:
Modem;
Ethernet

Weight: 7.1

System Use: Personal

Final Word: A premium price makes this notebook appealing only to those who require a rugged notebook. Good performance, and the system is well protected against abuse.

Anyone ever see a 4-year-old sitting in the audience of an R-rated movie and wonder what he's doing there? Similar thoughts run through my mind when I see a notebook at a construction site. There are just certain places where notebooks shouldn't tread, or at least, most notebooks. Panasonic's Toughbook series has a reputation for being rough-and-tumble.

Specifications. Internally, the Toughbook 72 isn't all that different from most notebooks. Our Toughbook 72 arrived with a 1.6GHz Pentium 4-M processor, 256MB of DDR SDRAM (upgradable to 768MB), and a 400MHz frontside bus.

The 30GB hard drive is a little on the small side, and there are no options for a larger hard drive. Our Toughbook 72 included a DVD/CD-RW combo drive, but a model with a DVD-ROM drive is available at a much lower price. The two-spindle design leaves no room for a floppy drive, but an optional modular floppy drive is available if you can't live without one.

Our model included a 13.3-inch TFT touch screen display (the touch screen is optional). Compared to similar-sized notebooks, the display is a little small, but it's well protected and very sturdy. The ATI Mobility RADEON 7500 graphics chip has 32MB of video memory and should be able to handle most multimedia applications.

Although our Toughbook 72 didn't include any wireless options, there are a bevy of options available if you're so inclined. In addition to 802.11b support, you can order a Toughbook 72 with support for CDPD, Mobitex, GSM/GPRS, or 1xRTT wireless data networks. Of course, a modem and Ethernet are provided.

Design. Aside from the wireless options, there isn't much inside the Toughbook 72 to differentiate it from other notebooks. The outside, however, is a different story. You can tell by looking at the Toughbook 72 that it'll withstand a beating. The magnesium alloy outer case should stand up to even the most abusive conditions. The inner chassis is nearly as strong as the outer magnesium alloy shell, and the hard drive is mounted to absorb shocks and

prevent mechanical damage. The keyboard and touchpad are spill-resistant, and the protection around the LCD is excellent.

Color on the LCD is a little faded, but that could be due to the antireflective coating that improves the display outdoors. I wouldn't use the display in direct sunlight, but outdoor viewing is generally better than a typical LCD.

The speakers weren't too bad. Like all notebook speakers, they lack range, but they have good volume and aren't nearly as shallow and tinny as some notebook speakers I've seen . . . er, heard over the years.

Performance. You might worry that Panasonic put all its energy into fortifying the Toughbook 72 and forgot about performance, but the numbers don't bear this out. In fact, the Panasonic Toughbook 72 posted slightly better performance scores than similar notebooks with 1.6GHz processors. The 116 Performance Rating was about eight points better than Sony's VAIO GRX570 and 16 points better than IBM's ThinkPad R32.

Lower battery life scores, however, balanced out the higher performance scores. The Toughbook 72 managed a 111-minute Battery Life rating compared to 137 minutes and 184 minutes for the VAIO GRX570 and ThinkPad R32, respectively.

PCMark2002 scores were hit and miss. The 3,912 CPU Rating compared favorably to similar systems. The 3,494 Memory Score was about average. The 447 HDD Score was more toward the high end when compared to systems with a similar configuration.

Final word. The Toughbook 72 is a difficult notebook to rate. Our model cost \$3,932, making it one of the most expensive models I've reviewed. At that price, there is no way I can recommend this notebook to the majority of our readers, but then again, Panasonic knows that. It's after a very small segment of the notebook market, and it's only fair to rate the notebook according to how it meets these users' needs. If you need a system that can stand up to significant abuse without sacrificing performance, you should certainly take a closer look at the Toughbook. ▲

by Chad Denton

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Sony VAIO C1MW PictureBook

Sony's C1MW PictureBook is a gadget lover's PC. Although it's not going to win any performance awards, it is extremely lightweight and compact.

Specifications. The C1MW leans heavily toward the portable extreme of the power vs. performance scale. The C1MW uses an 867MHz Transmeta Crusoe processor to cut down on power consumption and weight. Our unit arrived with 240MB of PC133 SDRAM and is upgradeable to as much as 384MB.

Measuring 1.2 inches high (when closed) x 9.9 inches wide x 6 inches deep, the C1MW doesn't have room for much beyond its core hardware and 32GB hard drive. An external DVD/CD-RW combo drive ships with the modem, and an optional external floppy drive (\$79.99) is available.

A V.90 modem is the only integrated communications option. An optional port replicator does provide you with an Ethernet port or you can use the single Type II PC Card to add Ethernet or Wi-Fi support.

At just 8.9 inches, the display is tiny compared to other lightweight systems such as IBM's ThinkPad X30. The ATI Mobility RADEON graphics chip with 8MB of video memory isn't going to run Unreal Tournament 2003 for you, but it's good enough to run business and multimedia applications reasonably well.

Design. Beyond a doubt, the coolest feature of the C1MW is its digital camera. The camera can rotate 180 degrees to snap a picture of you or a friend sitting across from you. The Smart Capture Premium software provides a live camera feed so you always know exactly what the shot will look like, and a hardware capture button lets you snap an image in an instant. The camera can capture both digital images and video. You can save images at resolutions up to 640 x 480 while you can save video at either 640 x 480 (long movie) or 240 x 112 (net video). Even in its net video setting, I noticed skips and pauses when playing back captured video. The software includes several filters, such as outline, emboss, old film, and black and white, that are applied directly to the camera feed (no need to snap a picture to see the effect).

Despite its problems playing back captured video, the C1MW did an admirable job with

DVD playback. The jog dial lets you quickly skip between chapters or pause a movie. The tiny little C1MW had better sound than I expected. In fact, the C1MW offered better sound than some larger low-end PCs.

The small display is very bright and crisp. The 1,280 x 600 resolution, however, makes text very hard to read on such a small display. Other resolutions are available, but 1,280 x 600 is the only resolution that fits completely on the C1MW's wide display.

The keyboard is also necessarily a bit cramped. The keys are a little smaller than they are on slightly larger notebooks, such as Sony's VAIO R505 line. Nonetheless, the layout is as good as can be expected. BACKSPACE and ENTER are relatively full-sized compared to the other keys, and Sony didn't place any navigational keys to the right of ENTER and BACKSPACE. My biggest complaint with the keyboard is due to the TrackPoint. The mouse buttons are mounted on the edge of the case right below the Spacebar, making it easy to accidentally click while typing.

Performance. I didn't expect big time performance numbers from the Crusoe processor. Its 57 MobileMark 2002 Performance Rating showed my expectation was justified.

The Crusoe processor is easier on the battery, but the C1MW doesn't ship with a very large battery, so battery life is still limited. MobileMark 2002 reported a 104-minute Battery Life Rating. The double-capacity Li-Ion battery should offer better performance, but you'll need to kick in an additional \$299.99.

Final word. I'm not very happy with the C1MW's performance, battery life, or lack of integrated networking options. The built-in video camera is a playful touch but not a reason to pick up a C1MW. The C1MW's saving grace is its portability. What the C1MW lacks in performance and flexibility, it makes up for in size and weight. If you believe smaller notebooks are better, give the C1MW PictureBook a look. ▲

by Chad Denton



VAIO C1MW PictureBook

\$2,099

Sony

(888) 315-7669

(408) 432-1600

www.sonystyle.com



Features

Processor:
867MHz Crusoe
Processor

RAM:
240MB/384MB

Hard Drive:
32GB

Optical Drive:
DVD/CD-RW
Combo Drive

Connectivity:
V.90 Modem

Weight: 2.2

System Use: Personal

Final Word: One of the smallest notebooks you are likely to find, although its performance and flexibility suffer a bit due to its small size.

MCE For Me?

Although I normally write about hardware every month, Microsoft's latest OS has got me talking about a piece of software for a change. I'm here to talk about Windows XP MCE (Media Center Edition).

What is MCE? The OS is basically Windows XP Professional with a new application built in known as Media Center (hence the name). The purpose behind MCE is to turn your PC into something you'd have in the living room: a PC that can pause/record live TV (a la TiVo or ReplayTV), play your MP3s, flip through digital photos, and even play DVDs; in essence, a Media Center PC.

Microsoft's contribution to the Media Center PC comes in the form of the OS, as well as a strict list of hardware guidelines. Currently MCE is only available to OEMs, and in the United States, only HP is shipping systems. Microsoft didn't want shoddy manufacturers producing poor Media Center PCs, so they carefully picked who could make the machines and what they could put in them.

By far the biggest restriction Microsoft imposed is for hardware-based MPEG-2 encoding. Hardware MPEG-2 encode, as you can guess, is very rare on TV tuners as it requires a fairly fast processor and thus makes for a more expensive tuner card. This unfortunately means that even if you used ATI's new All-In-Wonder 9700, you would not be able to use its tuner in MCE. HP uses an Emuz card, but the Hauppauge WinTV-PVR-250 is also supported.

The reasoning behind requiring a TV tuner with hardware MPEG-2 encoding support is to make sure that while you're watching TV through the machine that it never hiccups. Remember that when you're watching TV on a PVR (like MCE), the TV signal is sent into the tuner, MPEG-2-encoded, stored digitally on the hard drive and then read off of the hard drive, MPEG-2-decoded, and sent through a TV encoder on its way out to your TV; this happens for every frame while you're watching TV. Dedicated PVR units like those from TiVo and

ReplayTV have to use a hardware MPEG-2 encoder, as they do not have 2GHz+ processors at their disposal. With a Media Center PC, the hardware-assisted encoding is necessary because the PC still must function as a regular PC while it is moonlighting as a PVR. The additional processing power a Media Center PC possesses over a set-top box allowed Microsoft to make a much more attractive interface; at the same time, you can always close Media Center while it is recording a show and go back to typing a paper or even playing a game, just like you would with any other PC.

Microsoft also provides a general spec for including an IR remote with Media Center PCs. The combination of the remote and the elegant interface are what make MCE a viable competitor

to current PVRs. Once you're in the Media Center interface, you no longer need a keyboard or mouse, and navigating is easier than on most PVRs. A clear advantage of MCE is that it will allow you to share its hard drive and send recorded shows over your network. In theory, you should also be able to run a nightly

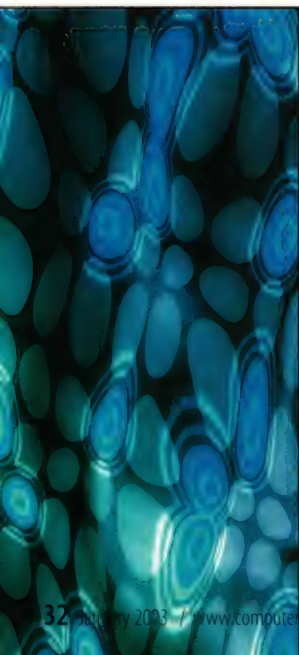
job that will convert all of your recordings to DivX format to save on space.

Did Microsoft pull it off with MCE? I've been using it for the past several weeks and I can say that MCE is definitely the best first try out of any PVR. The interface is very slick, and the PC (I tested an HP Pavilion 873n) worked fine as both a regular PC and a Media Center PC, but some issues still remain. Despite the presence of a hardware MPEG-2 encoder, CPU utilization still hovers around 30% while watching TV, and opening up MCE's built-in Guide for the first time always causes the TV feed to skip. Issues like that and random crashes (most of which were due to the poor setup of the HP PC; a clean format and reinstall fixed a number of them) never let you forget that you're still using a PC. ■

*Got feedback on MCE? Send it to
Anand@cpumag.com.*



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' 48 Hours and Fortune. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.



ATI Spreads Its Wings

Well-known fact: All the best comedians (this side of the Atlantic anyway), hockey players, and worst female solo artists come from Canada. Slightly less well-known fact: ATI's technical gurus conjured up the only DX9-capable 3D chip, which also happens to be the performance champion, in the R300. Pure speculation: NVIDIA's engineers may have swallowed some humble pie, but their cash registers keep on going "ka-ching."

Most of the money in the graphics business is made at the lower end of the market. Sure, it's nice to be top dog and own the majority of the market in the ultra-high-end performance sector, but the truth is that fewer \$400 boards get sold than the \$100 to \$200 products, and you can take that to the bank.

Instead of just "wish-ing" for that 9700 PRO, which is way too expensive for most consumers, ATI has to offer Radeons

ATI has to offer
Radeons for everyone.

for everyone and at much more aggressive prices where bang for the buck is concerned. In the \$100 to \$300 segments, despite the release of Radeon 9700 PRO boards, NVIDIA's GeForce4 Ti 4400 and 4200 have remained unchallenged until now. Part of the joyride made possible by owning the crown at the top end is that consumers really start craving your technology, even if they can't afford it. In other words, you can take advantage of an economic trickle down effect. This is what marketing people do; they try to figure this stuff out and generate loads a' money to keep shareholders happy, at least when they're not spending it on crappy advertising campaigns, that is.

So here we are, a few months on from the R300's introduction; ATI is now ready to tackle NVIDIA's money-rich apple pie (however humble) with the Radeon 9700, 9500 PRO, and 9500.

You know that Army commercial, "Be all you can be"? Well, think of the 9700 PRO epitomizing a four-star general and the 9700 as a slightly less glamorous but nevertheless highly decorated and ranked officer. With exactly the same R300 technology, eight rendering pipelines, and its 256-bit memory architecture behind it, it's only a little behind the PRO, thanks to being clocked down to 275MHz eClock and 540MHz (270 x

2). It's more of a Colin "Subtle" Powell than a Norman "Gung-Ho" Schwarzkopf. But for \$100 less, most gamers will go with Colin "9700" Powell, even in these troubled times.

The 9500 PRO is possibly the one of most interest. It uses the same R300 core as the 9700 PRO sans a couple of 64-bit DDR memory controllers, totaling two instead of four. Obviously the theoretical peak memory bandwidth suffers (~50%) in comparison to the 9700 PRO, but its 8.64GBps isn't exactly shabby, either and almost on par with NVIDIA's Ti 4400 8.8GBps. Clock speeds for the 9500 PRO are still a very respectable 275MHz eClock and 540MHz (270 x 2) for the 128MB of DDR memory. Snapping at the heels of Ti 4400s, if early performance

numbers are anything to go by, this one promises to be a right little screamer for \$199.

Aiming lower, the 9500, which is clocked

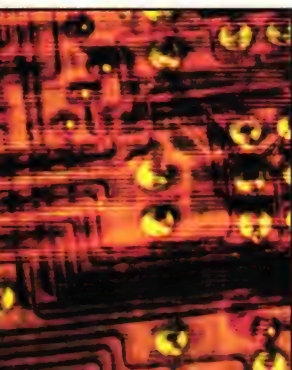
identically to the PRO, could end up being an OEM-filler priced at \$179. 64MB of DDR memory has been shaved off to keep the price down. Although with only four rendering pipelines as opposed to the PRO's eight, it's not really worth serious gamers giving it the time of day. Be all you can be, spend an extra \$20, reread the previous paragraphs, and don't become a grunt.

It's not likely that NVIDIA will take these releases lying down a la 9700 PRO; after all, the company's cash cow business is under attack now for real. Expect some kind of response, perhaps "faster" drivers for current GF4 products, further price reductions, or maybe even the release of NV "something," with ATI already whispering about DDR-2- and GDDR3-based products showing up early next year. So I like Canada and will try to come to terms with the thought of Celine Dion threatening to resurrect her career as long as gamers are kept happy with products across the board from ATI. I could probably handle Bryan Adams with a shot of NOS and a lot of sedatives, but where the heck is NV30? ■

Email sharky@cpumag.com and I'll think of something silly to reply with.



Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently swims in Silicon Valley.



OCin' In The New Year



Kyle Bennett is editor-in-chief of HardOCP.com, one of the largest and most outspoken PC-enthusiast sites on the Web. HardOCP.com is geared toward users with a passion for PCs and those who want to get cutting-edge performance from their systems. Beware, though, Kyle is known for his strong opinions and stating them in a no-nonsense manner while delivering some of the most in-depth reviews and PC hardware news on the 'Net.

Comdex will have come and gone by the time you read this, and NVIDIA's NV30 will have been launched, but it will most likely not be for sale in any large quantity. ATI's 9500 Pro should be on the shelves, along with plenty of RADEON 9000s and 9700s. And of course, everyone in the world with a broadband connection should have the leaked DOOM][Alpha by now. Even if you missed it, you should be playing Mafia, Hitman 2, Battlefield 1942, and UT2K3. Now that you have all these new toys, let's plan on what we "need" for Christmas, as it's feeling like a good time of the year for a CPU upgrade.

The sweet spot in the Athlon XP lineup now is the 2400+. Although a couple deep in paper launches, AMD has managed to get out some 2400+ CPUs. Keep in mind that these parts are based on the Thoroughbred "B" core, which has shown to be very much different from the first Tbreeds we saw. The "A" cores were terrible OCers, but the "B" is a much different animal. Not only does it overclock well, it also doesn't get near as hot as the first Tbreeds, which is most likely one of the main reasons these chips OC so well.

The Athlon XP 2400+ runs at a stock 133MHz x 15-core clock, giving it a rounded off 2GHz. From our experiences here on our workbench, you can expect no less than a 250MHz bump if you use a decent retail cooling solution, such as the Thermalright SK6 or AX-7. Both are fairly inexpensive units, cool well, and have a solid upgrade path currently. You can find such units online at reputable shops such as Plycon.com.

Remember that 250MHz is what we have seen on the low end. We have seen stable over-clocks with the 2400+ at 2.4GHz and better. That is even with the same cooling. There are some "lucky" chips out there for sure, and the best way to figure out what is what is to hang around in many of the hardware site forums—as you know, guys talk—and you hear things. You should be able to find the Athlon XP 2400+ online for around \$190 shipped. One more thing you will need to know: just short the last

L3 bridge on that CPU to unlock multipliers from 12.5 down.

What about you Intel guys out there? Don't think we have forgotten about you. As Intel has kicked its heels up with the release of the 3GHz HyperThreaded part, it has brought the rest of the Intel CPU family closer to many normal guys' budgets. Combine with that the incredibly scalable Northwood core and RAMBUS RDRAM going by the wayside and Intel has been earning the respect of enthusiasts again.

Still, you have to keep in mind that the multipliers on Intel CPUs are locked, and that of course can hinder your overclocking, especially with the 533MHz bus parts out for sale now. Our pick on the Pentium 4 side is a little harder to find, but it is out there. What you will be wanting is an Intel Pentium 4 2.5GHz CPU that uses the older 400MHz bus rating, which is selling for around

\$250. This will give you more room to adjust the bus since you are starting at 100MHz instead of an already accelerated 133MHz.

With the right board—and I would suggest an Intel i845PE-based board from either ASUS, ABIT, MSI, or AOpen, as they all have nice units out—you might very well move up to a 133MHz bus using the stock 25 multiplier. That will most likely require some heavy-duty cooling though, as 25 x 133 will give you a 3.3GHz CPU clock.

On the low end, the 2.5GHz Pentium 4 should easily yield a stable OC, even with factory cooling, of around 2.8GHz. A nice copper cooler, such as the AX-478, running with a decent fan is very likely to give you a mid-2.9GHz OC, and that is certainly nothing to sneeze at. A few folks we have talked to have broken the 3GHz barrier with the 2.5GHz Pentium 4, but most had to do it with water-cooling in order to get the chip stable.

Happy OCing, and let us know how your experience turns out. ■

One more thing you will need to know: just short the last L3 bridge on that CPU to unlock multipliers from 12.5 down.

Talk with Kyle at kyle@cpumag.com.

stretch your imagination



The CRW-F1 With Exclusive DiscT@2 Technology

The **Ultimate** CD Recorder

Yamaha's all new CRW-F1 is designed to enhance the style of the contemporary computer workstation. Engineered for easy connectivity via ATAPI, FireWire, USB 2.0 and SCSI, the CRW-F1 delivers reliable performance, high quality and top speed CD recording with whisper quiet operation.

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Quality Recording System and hear Yamaha's studio quality advantage in your own living room. Add in the industry first Ultra Speed ReWrite, the triple-guarded SafeBurn multitasking technology and the exclusive live recording mode, and you will discover why critics herald the new CRW-F1 as the *most complete* CD Recorder in the World!

So, whether you are a PC user or Mac user, let Yamaha CRW-F1's extraordinary features and technologies take you to a world with infinite possibilities and where stretching your imagination is just the beginning...



Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Because our writers don't want to lose their jobs, they always accept this challenge willingly. Tempers will flare. Tools will fly. But only one will prevail.

This month the challenge is to build the
Best PC For Integration Into Your Home Theatre For Less Than \$999

Samit

So building a decent HTPC (home theatre PC) is the order of the day, eh? Well, I had several thoughts on this matter, but all my calculations for building one at home came into the \$1,500+ range. That was the challenge. But I cut some corners and came up with something reasonable. (Not to worry: I'll also outline a few balls-to-the-wall options for those of you with more to spend.)

My first case choice was Cooler Master's ATC610-GX1 because it would have fit very nicely into my all-black component-width home audio stack. Unfortunately, it was not available in time for the magazine's deadline and was in a higher price range. I love the Shuttle XPC form factors so decided to go with the Shuttle SB51G (the case supports HyperThreading and is reviewed on page 19 of this issue) instead, but that was also not easily available, either (though it will be when you read this). So I "settled" (poor me) for a Shuttle SS51G (reviewed on page 18 of the November *CPU*). With built-in 5.1, optical in/out, FireWire, Ethernet connector, on-board video, and most importantly, two-expansion slots (AGP 4X, PCI), this case pretty much hit the spot.

For memory I dropped in 256MB PC2700 (a single 512 megger would be nice on a higher budget) into one of the two banks. I grudgingly stepped back from the 533MHz P4 2.53 and went with a 400MHz P4 1.5GHz CPU, which was cheap and good enough for the time being. The WD 80GB Special Edition (8MB cache) hard drive was a steal at \$45 after what I later discovered was probably a CompUSA rebate mistake: They sold it to me for \$85 including shipping, and there was a rebate after that.

Finally, I tossed in an ATI All-In-Wonder Radeon 7500 (with RF remote

and dongle for a variety of video-out options). Check it out at www.ati.com/products/pc/aiwradeon7500. Of course, what I really wanted was an All-In-Wonder 9700 Pro, but it was unavailable at press time and, er, slightly over my budget. But given the finances, the AIW 9700 Pro would be my AGP weapon of choice. For those without gaming desires, the AIW 8500 DV is slightly more expensive and a great alternative.

Hell, budget be damned. I could have stayed within budget constraints with a Samsung SM-332BEA (32X10X40) combo DVD/CD-RW drive for \$90, but I felt that any respectable HTPC needed to include a DVD writer. I was unable to get a Pioneer DVR-A05 in time and went with the pricier Sony DRU-500A, which supports both +/- RW formats.

Yeah, I tossed in a PCI modem (just in case), but you'd do better to consider a wireless network card or a Sound Blaster Audigy 2, which supports DVD-Audio. And for those of you building something like this next year, you may consider an NVIDIA GeForce FX-based card (for your special gaming needs), Hauppauge WinTV-PVR-350 SP, and the upcoming version of SnapStream Personal Video Station (\$49.99). There, that's my piece. (Think I'm going to build myself a similar system for the new year.) Sure I'm over budget and I might lose, but those are the brakes for Insidiousness. ▲



THE PC CHA



Samit Choudhuri
Publication Editor
Computer Power User

Component	Model	Price
Case	Shuttle XPC SS51G Barebones ¹	\$295
Motherboard	FS51 Small Form Factor (integrated with case)	N/A
Processor	Pentium 4 1.5GHz (Socket 478)	\$118
Memory	Crucial 256MB PC2700 DDR ²	\$88.19
Hard Drive	Western Digital 80GB Special Edition (with 8MB cache) ^{3*}	\$79.99
Video Card	ATI All-In-Wonder Radeon 7500 64MB AGP (OEM); integrated SiS 651 video ¹	\$120
Sound Card	Integrated Realtek ALC 650 (5.1 support) with SPDIF In/Out	N/A
Network Card	Integrated Realtek 8100B	N/A
Modem	Sterling V.92 PCI Softmodem ^{4*}	\$19.94
DVD+/-RW Drive	Sony DRU500A ^{5*}	\$326
Diskette	Sony 1.44 FD (OEM) ¹	\$8
Monitor	NA	N/A
Speakers	Use your home theatre receiver and speakers!	N/A
Keyboard/Mouse	Logitech Cordless Freedom Optical Mouse & Keyboard ^{6*}	\$89.99
Operating System	Windows XP Home Edition w/SP1 (OEM) ¹	\$93
Software	N/A	N/A
Miscellaneous	Integrated IEEE 1394A (VIA VT6306), four USB 2.0, two 3.5-inch drive bays, one 5.25-inch drive bay	N/A

Subtotal	\$1,238.11
Shipping	\$20.08
Tax	\$11.77
Rebates	\$136.04
Total	\$1,133.92

Purchased From:

*Items with rebate

- 1 NewEgg.com
- 2 Crucial Technology
- 3 CompUSA.com

- 4 Staples.com
- 5 MyInfinity.com
- 6 Amazon.com

CHALLENGE



Joshua Gulick
Staff Writer
Computer Power User



Component	Model	Price
Case	ATX generic case ¹	\$47.95
Motherboard	MSI KT4VL ⁴	\$84
Processor	AMD Athlon XP 1800+ ²	\$99.99
Memory	512 PC2700 DDR RAM ³	\$149
Hard Drive	Samsung 80GB 7200rpm ⁴	\$94
Video Card	ATI All-in-Wonder Radeon 8500 128MB ³	\$265
Sound Card	Creative Labs Sound Blaster Audigy PCI ³	\$67
Network Card	Integrated	N/A
Modem	N/A	N/A
DVD-ROM Drive	Toshiba SD-M1612 48X ³	\$46
Diskette	Floppy what?	N/A
Monitor	N/A	N/A
Speakers	N/A	N/A
Keyboard/ Mouse	Chieftec Wireless Keyboard and Mouse ⁴	\$20
Operating System	Windows XP Home (OEM)	\$91.99
Software	CyberLink PowerDVD 4.0, Matchware Mediator 6, and Ulead VideoStudio 5, and Valve Counter-Strike	N/A

Subtotal	\$964.93
Shipping	\$8.50
Tax	\$10.36
Rebates	\$0
Total	\$983.79

Purchased From:

¹ Computer Habit
² DIT Corp

³ GoogleGear.com
⁴ NewEgg.com

Joshua

This is my first time in the ring with the Insidious One. I put in my mouth guard, and the ref explained the rules (no biting, kicking, or sabotaging computers without bribing the ref). After slapping IO's oddly brick-shaped gloves, I headed to my corner. Burbie Boy knows a thing or two about entertainment, but I'm confident my party-in-a-box has what it takes.

As this month's challenge is a PC you can hook up to your entertainment system, you probably won't be tucking it under your desk. You'll need a machine that adds to the room's atmosphere, or at least one you're not embarrassed to have sitting next to the rest of your electronics. I dreamed up a flashy rig with a strobe light, a disco ball, and a tapper, but given that I'm a PC Challenge newbie and recent challengers have been beating the Insidiousness out of Samit, I decided that super-fly components are more important than my super-fly disco ball, if barely. With that in mind I focused on the hardware and picked up a cheapo black case that won't distract you and your friends from your special edition "Die Hard" DVD.

My MSI KT4VL motherboard handled all my gizmos and knocked the NIC card off my list. For juice, I installed an Athlon XP 1800+ processor and 512MB of DDR RAM. Then I brought in the real toys. I



would have loved to get the Radeon All-In-Wonder 9700 Pro video card with its extra video features, but the AIW 8500 suits my needs and costs about \$135 less. The 128MB card handles games beautifully, lets you connect to your stereo and TV, and has the all-important stereo tuner with live TV pause capabilities.

The included video-editing software isn't bad either, but the true icing on the cake is the RF remote control.

The Creative Labs Sound Blaster Audigy doesn't include a remote, but more than one remote would clutter up the room anyway. The Audigy does pump 5.1 Dolby digital through your stereo's speakers and does wonders for first-person shooters.

The fun stuff ate up a large portion of my cash, so I had to settle for a Samsung 80GB 7200rpm hard drive. You won't have room to store your entire movie collection in the box, but that's what DVDs are for, so I included a Toshiba DVD-ROM drive.

With the insides taken care of, I dug up a Chieftec wireless keyboard and mouse so you can enjoy the rig's power from the couch. Although I want the box to stay out of the way, the keyboard and mouse will obviously be in the limelight, so I ordered them (appropriately, I think) in lime green. If nothing else, I plan to win the award for style. ▲

And The Winner Is...

I'm tempted to follow Samit's apparent disregard for the rules that govern PC Challenge and declare him the winner, but I can't. My man is over budget. So what? Only by \$133 and change. Plus, if he would have swapped the drive, he would have made it under the line. And although the motto "if you ain't cheatin', you ain't tryin'" holds some credence with me, some rules you can't break and get away with. Joshua, you win. However, given the choice, I'd take the rule-breaking path, do my time, and enjoy the fruits of Samit's "budget be damned" labor. His superior Sony DRU500A hits the spot here (considering Joshua's drive choice lacks any writing capability), and I prefer Samit's Logitech devices (not a huge deal for sure, but aesthetically pleasing nonetheless) and easy-to-blend-in Shuttle box. With Samit, I also get Internet access now, which is vital for TV GUIDE Plus+ and more. But let's slow down here, not to mention be fair. Joshua made allowances to get under \$1,000. His respectable video card and sound options called for cutting back elsewhere, which he did. Kudos for staying on task. If acting under the same assumptions as Samit did, who knows what kind of different rig Joshua would have ended up with. In the end, "Breaking The Law" may have done wonders for Judas Priest, but it only gets the Insidious One a loss here in PC Challenge country, even if it is due to a (minor) technicality.



DE-TERMINATOR

*Blaine "I fought the law
and the law won"
Flamig*

Swappin' Parts

Back To The Basics

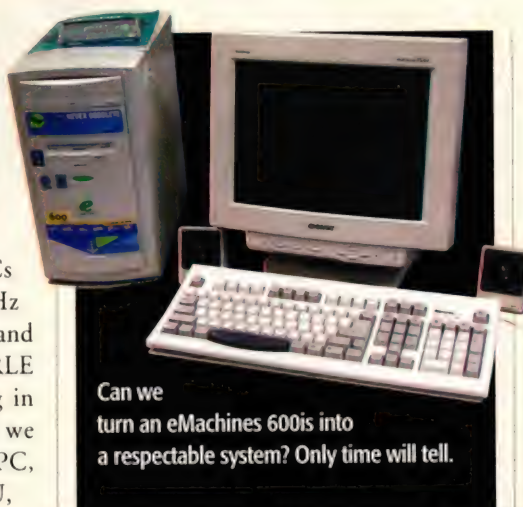
Something has been missing around the *Computer Power User* offices lately. We have not been able to rip a system apart since we had to retire MERLE (Mediocre Electronic Refurbished Low-end Equipment).

MERLE was one of our test PCs that started out as a lowly 850MHz Athlon system with a bad attitude and specs to match. We upgraded MERLE bit by bit over 11 months, starting in our December 2001 issue. When we were done, MERLE was a ripped PC, sporting an Athlon XP 2100+ CPU, 512MB of Corsair PC2700 DDR SDRAM, an ATI RADEON ALL-IN-WONDER 8500 video card, a 21-inch Sony monitor, and a Pioneer DVD-RW drive. We parked all of MERLE's hardware inside a massive Lian Li PC-70 case that we later customized with a window and a groovy paint job.

MERLE's absence around our offices started to get on our nerves. I've noticed that I have been picking at my desk phone lately. "I could add a faster dial pad to this baby," I'd think to myself, "and I'm sure it'd benefit from a water-cooling mod."

Samit must have noticed my behavior because one day he pulled me aside and told me it was time to bring "Swappin' Parts" back to the magazine. He put me in charge of finding a worthy replacement for MERLE, but this time he had some conditions.

The first condition was that I had to find a Pentium-based system so we could see how the other half lives. Second, the system had to be an old toaster of a machine. Third, it had to be a genuine home user's used PC from a local store. No building a PC from scratch this time out of used parts that



Can we turn an eMachines 600is into a respectable system? Only time will tell.



There isn't a whole lot to see inside of the 600is. We hope to change that.



we have lying around CPU headquarters, and it couldn't be a refurbished office PC, either.

I was to find a beat up PC off the street and purchase its freedom. This was going to be a salvage mission. Our goal in the coming months will be to restore the haggard machine to a state of glory.

The Search Is On

I scouted the dark underbelly of the used-computer scene in *CPU*'s hometown of Lincoln. Eventually, my search led me to a local Computer Renaissance. The store's shelves were strewn with ancient systems of all types, including Dells, Gateways, and a copious number of Packard Bells. I was tempted to pick a Packard Bell, but nothing can save those sorry machines.

Finally, a system caught my eye: an eMachines etower 600is. The system's case had a big factory sticker pasted across the top boldly proclaiming "This Computer Is Never Obsolete." Good enough for me, I thought. I should have read the fine print, which mentioned something about a \$20-per-month fee for ISP service as an insurance policy against this PC's obsolescence. Or something like that.

The system's price, including a 15-inch Sony monitor and tax, was \$485. Yikes! We could have bought a new eMachines for that much. It was a high price to pay for such a paltry jumble of hardware, but it was on the company's dime, and the PC's profile matched the guidelines that Samit had set for me.

The etower 600is was probably a decent enough system in its day. When we're done with it, the machine will cook again.

I placed an order with Accounting through Corey Russman, *CPU's* financial middleman. We got the thumbs-up (albeit an understandably tepid one) from the purse-holders to buy the system, so Corey and I drove to the store to pick it up. The shopkeeper asked us what we were going to do with the system. I said (with a straight face, mind you), "We're going to upgrade it." The salesman raised a doubting eyebrow and rang up our purchase. He informed me that the PC came with a 90-day warranty, provided we didn't fiddle with any of the system's hardware. After we had a good laugh over that, I brought the li'l PC back to CPU Central.

I'm sure the etower 600is was quite a machine in its day, but I wasn't terribly impressed as I inventoried its components. Check out what we have to work with: The processor is a 600MHz Intel Celeron, running on a whopping 66MHz system bus. There's 32MB of something that resembles SDRAM. The 10GB hard drive is roomy enough to store a decent number of MP3s and maybe a few games, assuming they are vintage ones. We're not going to be able to run Medal of Honor on this bad boy. Not yet, anyway. But the hard drive is woefully small by today's standards. The system's best peripheral is probably the 40X CD-ROM drive, which really underscores just how sorry this system is. For connectivity, there's a 56Kbps V.90 modem.

The etower 600is uses an integrated video chip and audio chip. The video chip is from Intel, which makes possibly the worst integrated video chips of all time. The audio chip is a Crystal SoundFusion number. The PC included a pair of speakers, of which I know little; there's no brand name or serial number to be found. The only thing I can determine about the speakers is that they're tiny, they sound bad, and they were made in China. The system didn't come with a monitor, but we added one for \$100. Really, for a 15-inch monitor, the Sony MultiScan 15SX isn't too shabby. The Computer Renaissance guy threw in a Memorex keyboard and

three-button Microsoft mouse, probably because he felt sorry for us, or for the machine, knowing what we would do to it. I'm not sure which. The front of the case houses a USB port and game

**The shopkeeper asked
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rang up our purchase.**

port. There's another USB port in back, along with the usual serial port and parallel port.

I popped the top off the etower 600is and poked around inside, which took all of 12 seconds because there's really nothing much in there. The system has three PCI slots, one occupied by the modem. There are two 5.25-inch drive bays, one occupied by the CD-ROM drive, and one 3.5-inch bay that is occupied by a floppy drive. There are no hard drive bays to speak of. The system's hard drive is bolted inside the front of the case. I especially noticed that there isn't an AGP slot. I started to feel queasy. Oh, by the way, this is a Windows Me system, which means the PC could be more unstable than nitroglycerin in a blender.

Mission Impossible?

Obviously, this machine needs a lot of work. Where to begin? Take your pick. Everything needs to be upgraded, but some upgrades will have to wait

until we upgrade the motherboard, and that's not going to happen right away.

There are plenty of changes we can make before switching motherboards, however. First, the case is way too small for our future needs. That will have to be an early fix. We can also quadruple the RAM for almost nothing and seriously improve this baby's performance, so we'll do this in the very near future. In addition, we can also add a decent sound card and set of speakers so the system won't screech like a banshee. A CD-RW drive is a must for any system, but a DVD-ROM or DVD-RW drive may have to wait for the time being. As far as I'm concerned, we can't replace WinMe fast enough.

The post-motherboard upgrades, will, of course, be much more interesting. We'll get a new Intel P4, some real RAM, and an AGP video card. Of course, a powerful video card attached to a 15-inch monitor won't do, so we'll have to get a bigger, better monitor. We'll pick up a pair of hard drives and run a RAID setup, and somewhere along the way we may perform a couple of mods.

You Name It

Before we do anything, however, we have to give this system an identity. We have to give it a name. MERLE, after all, had personality. MERLE had attitude. MERLE had soul. We need to imbue our new "Swappin' Parts" system with the same magic.

This time, however, *CPU's* editors and writers aren't going to christen our latest project PC. You will. Send us the winning entry, and we'll send *you* a shiny new Cooler Master case. So send us your best name suggestions to swappinparts@computerpoweruser.com. Next month, we'll announce the name of our test PC and the CPU reader who sent the winning name. And, of course, we'll start our renovation project. This is gonna be a tough one.

Until then... **CPU**

by Michael Sweet

X-ray Vision: Strained Silicon Yields Gain Without The Pain

A process that involves straining is generally not a good thing. Nobody wants eye-strain or a strained relationship. And what parent hasn't second-guessed himself for feeding the baby strained beets next to the white sofa, the white carpet, the white walls, and the white ceiling?

But apparently straining isn't always a bad thing. Intel's new 90nm manufacturing process consists of several groundbreaking technologies, including strained silicon, in which the manufacturing process stretches atoms within a lattice

to provide improved reliability and performance.

Strained Silicon Lattice

As Intel races to squeeze more performance out of continually shrinking transistors, strained silicon technology provides a key boost. As transistors shrink to near the atomic level, electron flow within the silicon lattice becomes a concern. In a normal silicon lattice, which is a framework of silicon atoms, the holes and gaps between the atoms are tight, restricting the flow of electrons.

Using a strained silicon lattice helps improve the flow of electrons by increasing the size of the holes and gaps between the silicon atoms. By using a mixture of germanium and silicon atoms in a layer under the silicon layer, the germanium atoms pull on the silicon layer, straining the silicon atoms by pulling them apart.

The increase in electron mobility through the strained silicon lattice results in a 10% to 20% increase in current flow through the transistor, which improves its overall performance, according to Intel. This increase in the speed of the current flow also means the transistor requires far less electrical power to operate.

Wondering how much this innovation will add to the cost of processors for consumers? Good news: Intel estimates that strained silicon technology will only add about 2% to the cost of a processed wafer. In addition, use of strained silicon technology doesn't increase problems with leakage within the transistor. (Nearly all transistors suffer from leakage, which is the loss of electrons through normal operations. A large amount of leakage forces the transistor to increase its electrical power consumption.)

Intel's 90nm Manufacturing Process

Of course, moving the idea of strained silicon technology from the planning stage to the fabrication plant represents a major undertaking. Not surprisingly, Intel has decided to debut strained silicon at the same time it undergoes another major undertaking: migrating from a 130nm manufacturing process to a 90nm manufacturing process. (One nanometer is equal to one-billionth of a meter;

Beyond Intel

Although Intel's recent decision to include strained silicon technology with its 90nm manufacturing process for microprocessors has introduced the technology to many people, the idea of strained silicon technology has existed for several years.

A small company named AmberWave has worked with the technology since the company launch in 1998 and holds several patents. AmberWave was developed as a spin-off company out of strained silicon technology research started at MIT. AmberWave announced in early 2002 an agreement with a wafer supplier to license AmberWave's strained silicon technology for incorporation in 200mm strained silicon wafers. AmberWave also is working with United

Microelectronics on strained silicon products.

In late 2002, AmberWave presented some findings that indicated the company had created a form of strained silicon that removed the need for using silicon germanium. However, that process, at least at this point, is extremely costly.

IBM and Hitachi.

Several semiconductor companies, including IBM and Hitachi, have embraced the idea of strained silicon technology because of its promises of improved performance and lower power consumption with minimal cost increases. IBM announced its development of strained silicon technologies in mid-2001. IBM is hoping to incorporate strained silicon technology into processors for IBM servers late in

2003. IBM hopes the initial strained silicon processors will be able to operate at clock speeds of 4GHz to 5GHz. Eventually, IBM sees strained silicon processors commonly appearing in handheld consumer products, where their low power consumption would be especially beneficial.

Hitachi's announcement concerning development of strained silicon technology occurred late in 2001. Although the company has made no specific announcements concerning future products, Hitachi has said it plans to incorporate strained silicon technology into its next generation of CMOS technologies. Toshiba, Fujitsu, and Taiwan Semiconductor Manufacturing also are working with strained silicon technology.

for comparison, a human hair is about 50,000nm in diameter.)

To maintain its goal of introducing increasingly faster and more powerful processors, Intel attempts to deliver new manufacturing processing technologies every two years. Within each new manufacturing process, the resulting processors provide a higher clock rate and the inclusion of more transistors on the chip. Intel also looks to improve overall performance by reducing power consumption. Using strained silicon technology can provide benefits in each of these areas.

Intel began using its 90nm manufacturing process to create transistors at its Hillsboro, Ore., 300mm fabrication plant in the second half of 2002. Intel has increased the size of its wafers to 300mm as part of the transition to the 90nm manufacturing process. The company now can fit about 120 billion transistors on a single 300mm wafer.

Intel's 90nm manufacturing process derives its name from the distance between the center of two interconnect lines running parallel to each other on the processor. At least historically, that's been the process by which Intel measures its manufacturing process. As the manufacturing process continues to shrink, some lines are farther apart than 90nm and some are closer together. The name 90nm has become more of a label than an exact measurement of the process.

Intel hopes to fully introduce the 90nm manufacturing process in the second half of 2003 at a few other 300mm manufacturing fabs, including those in Albuquerque, N.M., and Ireland. (The company plans to continue using its current 200mm fabs to manufacture older chips.) Intel's main 90nm product will be its next-generation microprocessor, code-named Prescott. Prescott should be introduced in the second half of 2003, and it will be the first widespread product to incorporate strained silicon technology.

Straining For Acceptance

In the past, Intel had downplayed the importance of strained silicon technology in creating faster microprocessors. However, some skeptical industry analysts think Intel's public comments on strained silicon technology were simply a smokescreen for the company's own work on developing the technology.

Whatever the case, the word on strained silicon is out now. Intel's use of strained silicon in Prescott will be the most visible vote of acceptance for the technology, thrusting it squarely into the public eye . . . if you could actually see the nanotechnology in use, that is. **CPU**

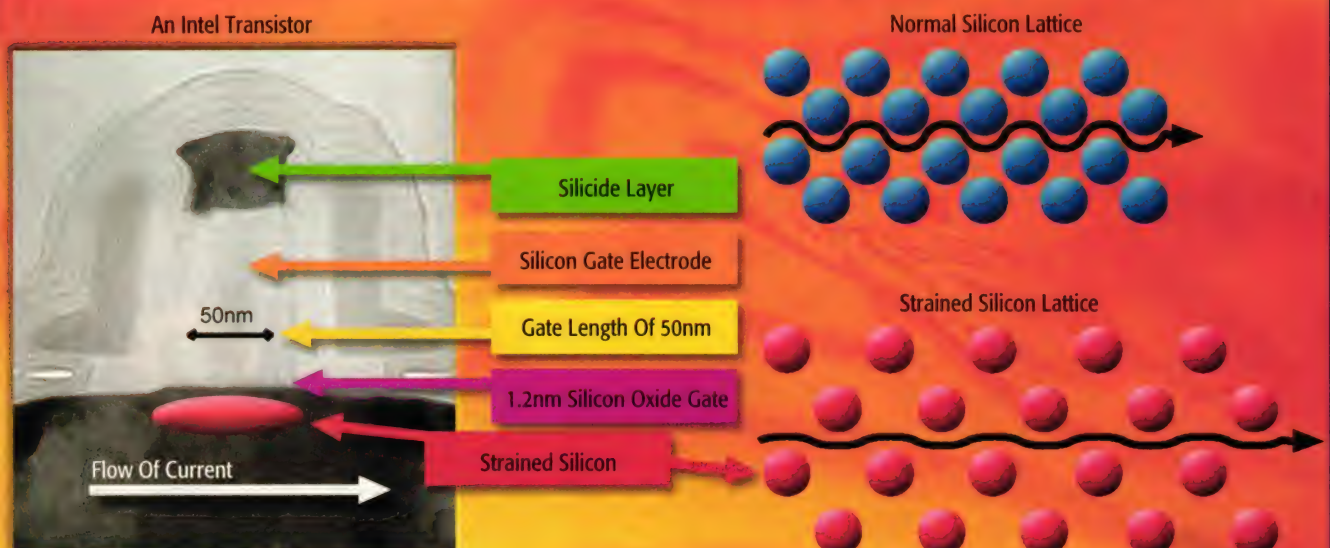
by Kyle Schurman

For more on creating and manipulating strained silicon and Intel's 90nm manufacturing process, see www.cpumag.com/cpujan03/silicon.

Illustrating Strained Silicon

Using Intel's 90nm manufacturing process, the company can create transistors with a 50nm gate length, making it the smallest CMOS transistor. The silicon oxide gate is 1.2nm in thickness, equal to about five atomic layers. For comparison, consider that a flu virus is 100nm in width, about double the size of a transistor's gate length, as shown in the illustration below. A human hair is about 50,000nm in diameter.

By adding strained silicon to the 90nm manufacturing process, the flow of electrons in the current can move through the transistor much more quickly than in a normal silicon lattice. The atoms in the strained silicon lattice are "stretched" to create larger gaps between them and allow for less resistance against the flow of electrons. Intel estimates strained silicon can improve the electron flow by 10% to 20%; other sources estimate the improvement at 10% to 75%.



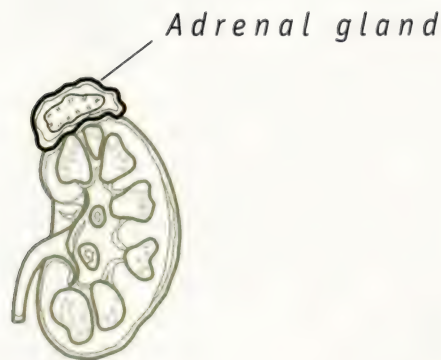


fig.1



One essential piece of equipment for this game is in your body.

The other is in your computer.

A teeth-grinding adrenaline rush. A grenade-sized lump in your throat. The trigger-tingling sense that someone is watching you. It's all part of the over-the-top realism you'll experience in *Soldier of Fortune 2: Double Helix*. Why? Because this ultra-realistic game was designed for the optimum performance you can only get from a computer juiced with the high-speed performance of an NVIDIA® graphics processor. So plunge into the secret and deadly world of covert operations with the firepower of NVIDIA... and play the game the way it was meant to be played.



Visit your local CompUSA or log on to www.gamefixx.com/nvidia/

HD-BURN

Bridging The Gap From CDs To DVDs

For some, patience is a virtue. For computer users, patience is often an unwelcome necessity. You hear about an awesome new technology, but you almost always have to wait several months for the companies involved in creating the technology to agree on a workable standard. And those who only have to wait several months are usually the lucky ones: For some technologies, such as writable DVDs, the companies involved can't agree on a workable standard. The lack of a standard can delay product introduction and splinter the overall market.

Sometimes, though, such delays give other companies a chance to introduce a complementary technology. SANYO Electric in Japan is looking to give consumers interested in CD and DVD burning another option. That option is called HD-BURN, or High Density-Burn, and

it should be available in the United States in a few months.

More Data, Same Space

SANYO began working on HD-BURN in 2000 and introduced the technology in September 2002. Essentially, HD-BURN technology gives users 1.4GB of storage space on a CD-R, about double the normal storage capacity of a CD-R.

The shrinking pit. One way HD-BURN is able to squeeze more data onto a CD-R is by altering the pit size of conventional CD-R media. With HD-BURN technology, SANYO is able to shrink the minimum pit length on the disc from 830nm for a conventional CD-R to 620nm for an HD-BURN disc (a CD-R burned with an HD-BURN drive). The smaller pits let an HD-BURN disc store about 35% more data than a conventional CD-R.

HD-BURN discs maintain the same pit width, the same track pitch, and—obviously—the same physical size of CD-Rs. SANYO could've squeezed more data onto the HD-BURN discs by using a smaller track pitch or a narrower pit, but then HD-BURN drives wouldn't be able to make use of conventional CD-Rs.

Improved error correction. Perhaps the more impressive technology in use with HD-BURN is its improved mode of error correction. SANYO developed a new error correction mode, called RS-PC (Reed-Solomon Product Code) for its HD-BURN drives. Conventional CD-R drives use CIRC (Cross-Interleaved Reed-Solomon Code) as an error correction mode.

Given the high speeds of the lasers that create CD-Rs, errors are a strong possibility, making foolproof error-correction capabilities extremely important. When burning a disc with a conventional CD-R drive, error-correction data must occupy a large amount of storage space, which limits the amount of space on the disc for other data. HD-BURN's mode of error correction requires about 49% less storage space on the CD-R.

So between the space saved on the disc by creating smaller pit lengths and using less room for error-correction data, CD-Rs created with HD-BURN technology are able to fit twice as much data as is possible on a disc created with the conventional method.

The Middleman

SANYO is aiming HD-BURN technology at consumers who have outgrown the data storage limitations of CD burning and are frustrated while waiting for DVD burning options to sort themselves out and become standardized. SANYO also says HD-BURN

Optical Disc Media Prices

By using standard CD-Rs, HD-BURN drives give consumers the least expensive option for blank optical disc media. The total price column shows a price range depending on the brand of disc involved and the disc spin speed. All of the DVD options are 4.7GB capacity.

Media Type	Package Size	Total Price	Approximate Price Per Disc
CD-R	50-pack	\$10 to \$20	30 cents
CD-R 3-inch (180MB)	50-pack	\$20 to \$35	55 cents
CD-R CardDisc (50MB)	50-pack	\$25 to \$40	65 cents
CD-RW	50-pack	\$25 to \$40	65 cents
DVD-R	10-pack	\$15 to \$30	\$2.25
DVD+R	10-pack	\$15 to \$35	\$2.50
DVD-RW	10-pack	\$35 to \$50	\$4.25
DVD+RW	10-pack	\$40 to \$50	\$4.50
DVD-RAM	5-pack	\$30 to \$50	\$8

SOURCES: TIGERDIRECT.COM AND DISCMARKERS.COM

It's The Pits

A nanometer is one-millionth of a millimeter. A human hair is about 50,000nm wide.

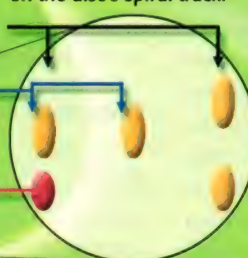
With its new HD-BURN technology, SANYO is hoping to mesh a few of the better aspects of CD burning and DVD burning and give consumers an inexpensive, middle-of-the-road choice. As you can see here, HD-BURN borrows from both DVD and CD technology.



When using a CD burner, the standard track width is 1,600nm.

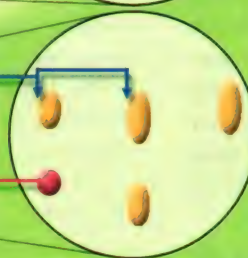
And on a CD burner, the minimum pit length is 830nm; pit width is 500nm.

Each column represents an individual revolution on the disc's spiral track.



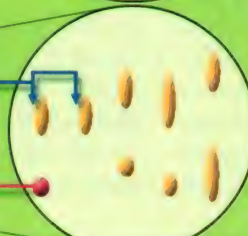
When using an HD-BURN drive, the standard track width remains 1,600nm.

The minimum pit length on an HD-BURN drive is 620nm; pit width remains 500nm.



On a DVD, the standard track width shrinks to 740nm.

The minimum pit length on a DVD is 400nm; pit width shrinks to 320nm.



~20,000X magnification

The optical discs used with all three technologies are roughly the same size—about 120mm in diameter. However, the composition of the DVD is different from the CD-Rs used with HD-BURN, which allows a DVD to store more data by using smaller pit lengths and widths and a tighter track width. HD-BURN technology cannot change the track width or the pit width on the CD-R, but it is able to store more data on the disc than can a CD-R burner by decreasing the minimum size requirement for pit length on the disc. This lets HD-BURN squeeze more pits onto a disc. The smaller pits, combined with a more efficient error-correction mode, allow HD-BURN discs to store about 1.4GB of data, double that of a CD-R.

can serve as the middleman between the 650MB to 700MB of data storage available on a CD and the 4.7GB of data storage on a basic DVD. SANYO says some consumers will be unable to fill an entire DVD-R; the HD-BURN technology will give such consumers a smaller and less expensive storage option that may better meet their needs.

At least initially, the company plans to incorporate HD-BURN technology into its own HD-BURN drives, which will be called Super Combination Drives or SuperCombiDrives (CRD-DV2). Other optical disc drive manufacturers will be able to license the technology from SANYO to create their own HD-BURN drives. SANYO expects to produce 30,000 drives per month at some time after the first quarter of 2003. The units mainly will appear in Japan at first with a price of about 50,000 yen (about

\$400). The date for widespread availability of HD-BURN drives in the United States remains up in the air.

With some modification of the firmware, most DVD players and CD-ROM drives eventually should be able to read discs created with HD-BURN technology properly. However, it's still unclear how many disc player manufacturers will be willing to include an HD-BURN firmware upgrade. SANYO hopes to expedite the process of adopting the technology among optical disc player manufacturers by disclosing the HD-BURN technology to them for free.

Was This Trip Really Necessary?

Certainly, HD-BURN technology sounds like a great idea, but you have to wonder whether SANYO missed its best window of opportunity to release the

technology. We didn't have to look too far to find possible evidence of SANYO's timing problems with the release of HD-BURN. In the company's press release announcing HD-BURN, SANYO says, "CD-R media is rapidly becoming popular." Huh? Maybe something was lost in the translation, but the last time we checked, CD-R media rapidly became popular a couple of years ago. CD-R media is currently taking a backseat to CD-RWs in many instances.

Don't forget about recordable DVDs, either. Even though we're still waiting (and waiting and waiting) for a recordable DVD standard, recordable DVD options are available, with a minimum of 3.3 times the storage capacity of an HD-BURN disc.

CD-Rs certainly have their place, such as when creating CD audio. But

HD-BURN discs won't work with CD audio players, meaning you'll have to stick with a conventional CD burner—and 650MB to 700MB of storage space—when burning your own audio CDs.

Doubling the data storage capacity of a CD-R is a nice idea, but it probably would've been more effective and useful had SANYO introduced it soon after CD burning became mainstream a few years ago. With DVD burning on the way to becoming mainstream (it'll happen at some point; we promise), consumers might have a hard time committing about \$400 for an HD-BURN drive that provides less than 30% of the data storage possible on a burnable DVD.

Seeking Its Niche

HD-BURN's use of CD-Rs does give it one big advantage over other optical disc burning options: A low operational cost. CD-Rs are inexpensive, usually costing a quarter or two apiece when you buy them in bulk, making them a

popular choice for consumers. Recordable DVDs are currently far more expensive than CD-Rs.

With a 1.4GB data capacity, HD-BURN discs can store many large video files intact, as well. If you're using a conventional CD-R for backing up large video files, you're limited in the size of the file you can save on the disc, or you must split the file between two CD-Rs.

Finally, SANYO is planning to add support for CD-RWs in its HD-BURN drives in the future, which would make HD-BURN's impressive technology more useful and flexible. However, an impressive technology doesn't always translate into a runaway business success. Although HD-BURN technology doesn't have a crash-and-burn feel, it does have the feel of a niche technology. The question for SANYO will be just how many consumers will choose to fit within HD-BURN's niche. **CPU**

by Kyle Schurman

BURN-Proof Technology

Another advantage of SANYO's HD-BURN drive is its inclusion of BURN-Proof technology, which helps prevent buffer underrun errors. Although many companies incorporate BURN-Proof technology into their optical disc burning drives, the name BURN-Proof is a trademark of SANYO. (In this case, BURN is short for "Buffer UnderRuN error.")

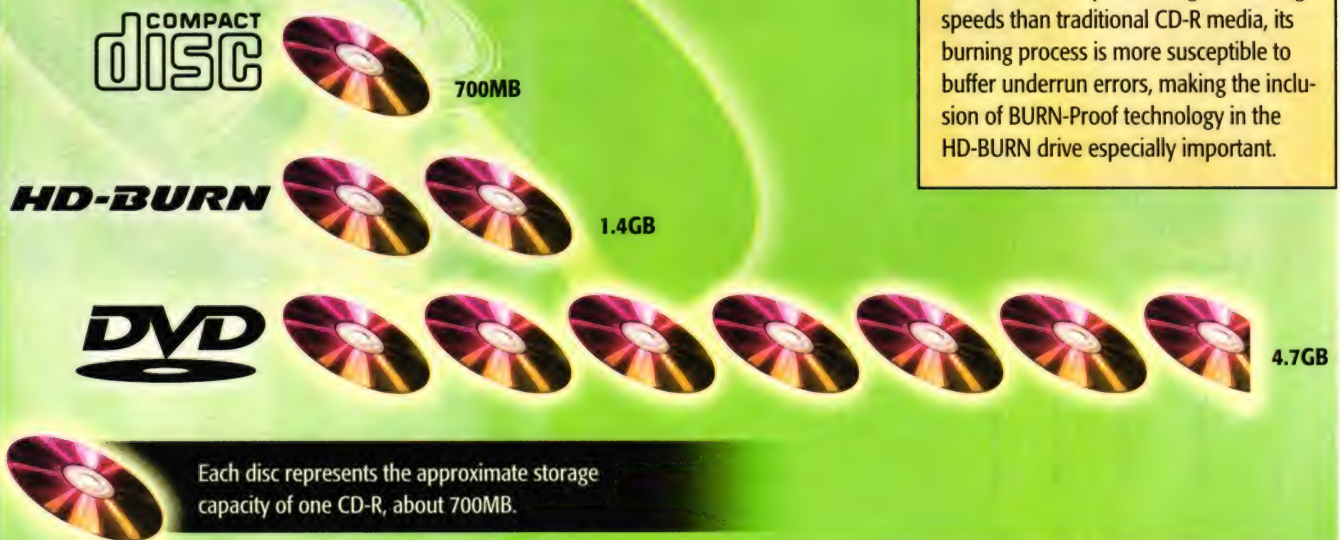
When burning an optical disc, the drive stores data waiting to be burned onto the disc in a buffer. By using a buffer, the drive ensures it will have a continuous stream of data available, which prevents burning errors. However, if the buffer runs out of data during the burning process, the ensuing interruption throws off the entire burning process and often renders the optical disc unusable.

Buffer underrun errors were common in early recordable CD drives, but the development of technologies such as BURN-Proof has aggressively limited such problems. BURN-proof technology anticipates the possibility of the buffer running out of data and warns the burning drive, which slows or pauses the burning process, to let the buffer refill before a buffer underrun error occurs.

Because SANYO's HD-BURN drive involves smaller pits and higher burning speeds than traditional CD-R media, its burning process is more susceptible to buffer underrun errors, making the inclusion of BURN-Proof technology in the HD-BURN drive especially important.

Optical Disc Storage Comparisons

By improving on original CD-R burning techniques, an HD-BURN drive can double the storage space available on a CD-R. Although HD-BURN discs still lag far behind DVDs in overall storage capacity, the HD-BURN drive's ability to use inexpensive CD-Rs gives HD-BURN technology some cost-effectiveness advantages over current DVD burning options.



room to burn



VINYL



DIGITAL VIDEO



DATA BACKUP



ORIGINAL MUSIC



DIGITAL PHOTO



MP3





Get organized, and take your files with you wherever you go. Burn all your data, video, photography, MP3s, vinyl, cassettes and whatever else you've got to CD with Easy CD Creator® 5 Platinum, from Roxio. The best selling CD burning software in the world. You can even create your own personalized jewel cases for each disc. Hit roxio.com to find out how. Mac® users check out Roxio's Toast® 5.

Now Windows® XP compatible.



A NEW YEAR OF RESOLUTIONS

The Right Video Card For Every User

by Michael Sweet
Graphics & Design by Andria Schultz
& Carrie Benes

The holiday season is the best time of year for many reasons, not the least of which is that companies usually release a slew of tempting new computer products. This is especially true of video card manufacturers. Now is an excellent time for power users and pinchpennies alike to trade up to a shiny new card because users of every need and budget have a wealth of good products to choose from. But with so many choices, some users may have trouble zeroing in on their ideal video card.

Many of you will be tempted to reach for a Radeon 9700 Pro-based card right off the bat, at least until you see the price tag (we're the same way). It's the best GPU available at this time, and who doesn't want the best? But high-end, high-priced video cards aren't practical for everyone. Installing a \$400 video card in a 1GHz PC that you built for \$500 doesn't make any more sense than installing a \$1,200 stereo in your '71 Pinto. The card you buy should be a good fit for the rest of your computer hardware. An honest assessment of your computing hardware (and computing lifestyle) will ensure that you find the best video card for you. Here's a look at some likely user scenarios and the best card choices for each.

Budget User \$0 to \$100

Situation: You have \$1.84 in your checking account. You play a few games now and again, but you primarily use your PC for more practical purposes: Web surfing, email, word processing, and trying to use financial software to figure out why you only have \$1.84 in your checking account. You want

a better video card than the old ATI Xpert 128 currently puffing out pixels to your monitor, but upgrading to a \$350 video card would be damn extravagant.

Options: The MX line of NVIDIA GeForce4 GPUs is aimed directly at you. You can pick up a card using a GeForce4 MX 460 chip (with 64MB of RAM) or GeForce4 MX 440 (with 128MB of RAM) for about \$100 but likely less. ATI's answer to the NVIDIA MX line is the 9000 Pro GPU, which has better DirectX support, yet costs about the same as an MX 460 card. Right now, this is

SPOTLIGHT HIGHLIGHTS

ATI R300

3Dlabs P10

Matrox Parhelia-512

NVIDIA GeForce FX
(NV30)

3D GAMES: THEN & NOW

We take video cards and the awesome power they generate for granted. Seriously, 128MB of onboard RAM? It wasn't so long ago that much system memory was considered ostentatious. And how many hundreds of frames per second do we really need to squeeze out of Quake III? Of course, today's best video cards aren't designed for games now but for upcoming graphical marvels. Once in a while, though, we should stop and consider where we've been and where we're going. Here are a few

great milestones in 3D video gaming history, as well as related events.

1981: IBM releases the Monochrome Graphics Display adapter in August; Wizardry is released, using only rudimentary graphics to give players a vague sense of perspective. The game incorporates hardly any graphical elements, relying mostly on text messages to describe action. Players even have to (gulp!) *type in* commands to carry out tasks.

Wizardry



the best option for budget users, especially if you want to play games. A non-Pro Radeon 9000 version is also available for about \$70.

New possibilities: NVIDIA recently released an 8X AGP version of the GeForce4 MX 440 GPU. It's unlikely the 8X version will be significantly faster than the original version, but the simple fact that it *is* 8X AGP will hook some buyers.

**Power Users
(General
Computing)
\$150 to \$500**

Situation: Your PC is more than just an Internet machine. You use it for a little of everything, including ripping and mixing audio, editing home videos, and creating Web pages. You love downloadable movie trailers, and you're into the latest games. Perhaps you have a home office and the notion of running two or more monitors from one PC makes you feel kind of tingly. You might not eat silicon for breakfast everyday, but you still log plenty of hours on your system. The key here is versatility. You need a card that does a little bit of everything well.

Options: Cards based on a ATI R300 or NVIDIA GeForce FX chip are certainly worth considering, but they're not a necessity. A GeForce4 Ti 4200 card will give you plenty of power for today's games, yet its price is still consumer-friendly (\$150 to \$200). Users who demand 2D excellence can hardly go wrong with Matrox's Parhelia (\$300 to \$350), which delivers superior image

quality and supports up to three monitors. The Parhelia's 3D prowess isn't as strong as we hoped it would be, but it's not *that* bad.

New possibilities: Video cards based on ATI's Radeon 9500 Pro and Radeon 9700 GPUs should match up more or less squarely (price-wise) with GeForce4 Ti 4200 cards. NVIDIA counters with an 8X AGP version of the Ti 4200, which to now has been the best overall GPU in terms of price and performance. If you want maximum power and maximum versatility, it's hard to beat the 9700 Pro (approximately \$500), which has a TV tuner, video capture ability, and incredible graphics. The card should be available as you read this. Whether you have the necessary funds is another story.

**Power Users
(Gamers)
\$200 to \$500**

Situation: Yeah, you can use your rig for just about anything, but you usually use it to play yet another round of Unreal Tournament at 3 a.m. You love fast frame rates, you love gorgeously rendered games, and you love turning your buddies into giblets at LAN parties. Doom III is coming. You need to be ready. \$350 or more for a video card? Hey, if you wanna be the best, you have to pony up for the best.

Options: For now, there's one clear option for serious gamers: the Radeon 9700 Pro. You *could* buy a GeForce4 Ti 4600 card (\$240), save a few bucks, and have nearly the performance of the 9700 Pro

(\$320), but that wouldn't be good enough for you, now would it? Besides, there's little reason to buy a Ti 4600 card now with GeForce FX's imminent release. If you want the fastest NVIDIA card, wait for the GeForce FX, which should blow the socks, shoes, and maybe even a few toenails off past NVIDIA cards. It should also almost certainly rival the 9700 Pro's performance (though this remains to be seen). If you still prefer the Ti 4600, wait until the GeForce FX is released and Ti 4600 prices drop as a result.

New possibilities: It's all about the GeForce FX now; its release will definitely have big implications. We're just not sure what they'll be, yet. It may re-establish NVIDIA as the best or prove ATI's Radeon 9700 Pro is simply too good for the competition this time around. Like most of you, we're anxious to see how this one plays out.

And Your Card Is . . .

Face it: Some upgrades are more exciting than others. A new hard drive is practical, a faster CD-RW drive is useful, and additional RAM is usually helpful. But there's something about a video card upgrade that brings a sparkle to the eye. And it's not just because of the natural association between video cards and games. The video card you buy defines your PC and the type of user you are perhaps more than any peripheral. No wonder they're so important to us. **CPU**

by Michael Sweet

1992: ATI releases the Graphics Ultra Pro video card with two whole megabytes of DRAM; Wolfenstein 3D essentially starts the 3D game genre for PC users, delivering fast, fun gameplay in an exciting 3D environment. You can't look up or down, however, and the graphics are as blocky as a LEGO set. DOOM will come out a year later with better graphics and gameplay.

1994: Descent takes the 3D shooter to a new level with a full

360 degrees of movement through winding tunnels and twisting levels; Myst appears, becoming a phenom-



enal bestseller with photo-realistic images created with Adobe Photoshop, Premiere, and Illustrator and a handful of other programs; Hercules and Diamond Multimedia video PCI cards are top choices for gamers.

1998: Unreal isn't as big a hit as its contemporary, Half-Life,



but the game's sheer physical beauty sets many hearts a-pounding and demonstrates how

far designers can push the graphics envelope with constantly improving video-card technology; 3dfx releases the beloved Voodoo 2 video card, and NVIDIA releases the TNT graphics chip, setting the stage for an intense battle for market share, which NVIDIA eventually wins.



2003: Carmack and company have seemingly been working on DOOM III for 127 years now, but the recently leaked DOOM III demo looks slick. If id Software can weave the same graphical magic it did into the company's other landmark games, we're in for some serious eye candy. ATI's Radeon 9700 Pro should make DOOM III sizzle. Meanwhile,

NVIDIA supporters look forward to the GeForce FX's Q1 or Q2 release. ▲

VIDEO CARDS EXPOSED

The Material You Are About To Read Is Extremely Graphic

When choosing a graphics card, you need to decide what is most important to you and then be OK with the consequences. A top-of-the-line card with all the trimmings is going to set you back close to \$400. The unrivaled performance in OpenGL and D3D is short-lived: It is usually surpassed in six months by the next generation of hardware. Unless you plan on plunking down \$400 twice a year, you'll have the next best thing at some point. So even if raw performance is your goal, it's wise to consider features. For those into something beyond fragging on steroids, the market has opened up for multimedia support, better mobile solutions, multiple-display support, and stellar 2D graphics without an enormous sacrifice in gaming speed. We'll look at the top performers there, as well.

Head Of The Class

When looking for a card with unmatched 3D performance, there used to be only one real choice: the NVIDIA GeForce4 Ti 4600. As this latest round of benchmarks shows (right), the Ti 4600 still performs admirably where bog standard benchmarks are concerned. But top of the line nowadays with UT 2003 doesn't just equate to raw horsepower; we gamers want speed but with flashy effects enabled, such as full-scene anti-aliasing and anisotropic filtering. Under such conditions, the GF4 Ti 4600 is brought to its knees, and a new contender for the throne shows its muscles. With the delay of NV30 hardware, searching for the leader meant you could look no further than ATI's R300-based Radeon 9700 Pro (Oct. *CPU*, page 20, 42-45).

What's Under the R300 Hood?

This brute is based upon the fully DX9-capable R300 flip chip. And what a chip it is. . . . Even though Microsoft has yet to officially release DX9, the R300 technology is mighty impressive

the R300 uses 256-bit memory with four load-balanced 64-bit memory controllers: The 9700 Pro is a bandwidth beast with a theoretical 19.2GBps.

Its eight 128-bit floating-point pixel-rendering pipelines give the 9700 Pro

9700 PRO VS. GF4 TI 4600 BENCHMARKS

	ATI 9700 Pro	GF4 Ti 4600	9700 Pro with 4XAA	GF4 Ti 4600 with 4XAA
3DMark2001 1,024 x 768	14220	12135	10520	6120
Aquamark	45	34	30	13
Quake III	203	143	107	45
Jedi Knight II	123	107	78	32
Max Payne	84	61	77	28

*Tested on a WinXP Pro P4 2.53GHz

	9700 Pro	GF4 Ti 4600
3DMark2001 1,024 x 768	13317	12106
Quake III 1,280 x 1,024	235	198
Unreal Tournament 2003 FLYBy 1,280 x 1,024	148	105

*Tested on a WinXP Pro Athlon XP 2700+

	9700 Pro	GF4 Ti 4600	9700 Pro with 4XAA & 16X AF	GF4 Ti 4600 with 4XAA & 16X AF
UT 2003 DM Antalus 1,280 x 1,024	105	62	43	17

*Tested on a WinXP Pro P4 2.53GHz

	9700 Pro	GF4 Ti 4600	9700 Pro with 4XAA	GF4 Ti 4600w/ 4XAA	9700 Pro with 4XAA & 8x AF	GF4 Ti 4600 with 4XAA 8X AF
Quake III 1,280 x 1,024	235	198	170	61	163	56

*Tested on a WinXP Pro Athlon XP 2700+

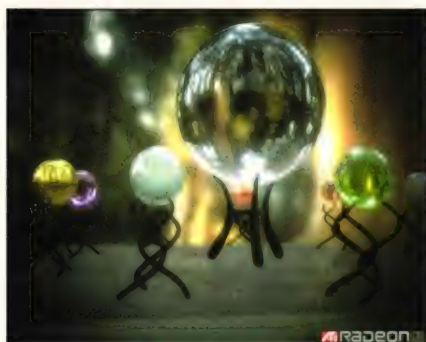
and very effective in DX7 and 8 situations. (As we go to press, ATI has finally been allowed to release its CATALYST driver software in support of DirectX 9.0 Release Candidate Zero release.) Based on a 0.15-micron manufacturing process, the chip is rather beefy, packing 110 million transistors. Clocking at 325MHz and with 128MB of 310MHz (effectively 620MHz) DDR memory,

superb fill rate capabilities. The Pixel Shader 2.0 spec is fully supported and thus when DX9 games ship, the 9700 Pro will be ready and willing to execute as many as 160 pixel shader instructions per pass. With four programmable vertex shader pipelines, the 9700 Pro can whip through 300 million triangles per second where vertex processing is concerned, which is twice as fast as the GF4 Ti 4600 and more fancy, thanks to the



ATI Radeon 9700 Pro and ATI R300: the combo that surprised the heck out of everybody by taking NVIDIA's speed crown.

inclusion of the Vertex Shader 2.0 DX9 spec, which support up to 1,024 vertex shader instructions per pass and static flow control. Combined with TrueForm 2.0 (additional tessellation options), R300 has



This is your new reality for high-end graphics hardware. ATI's Natural Light Demo really shows how far the hardware has come.

promised to offer more immersive graphics when the time comes with DX9.

ATI's engineers recognized the poor anti-aliasing performance with its previous generation R200-based cards and, for the R300, have developed SmoothVision 2.0. They have added multisampling techniques, allowing for 2X, 4X, and 6X full-scene anti-aliasing modes in games. Not only is speed much improved, but so is the quality, which sets it apart from NVIDIA's GF4s. Jaggies and pixel popping are a thing of the past. ATI has plans to expose additional R300 pixel and vertex shader support. (See "Shader Comparison" chart.)

Anisotropic filtering is a feature that usually clogs the pipes, but with the 9700 Pro, filtering is much improved and runs without too much of a performance hit. You can choose 16X, 8X, 4X, and 2X texture samples per pixel modes. The R300 doesn't waste resources by filtering all textures using the chosen algorithm level (e.g. 16X) and instead "adaptively"

calculates how to filter a texture depending upon the angle at which you end up viewing the texture. This makes the 9700 Pro a real anisotropic filtering and full-scene anti-aliasing monster. Throw in ATI's Hyper Z III Lossless Z compression and fast Z-Clear techniques, and the 9700 Pro becomes even more efficient when it comes to addressing the problems of bandwidth limitations.

OEMs have really taken to the R300 chip and offer several flavors of it, including the 9700 Pro, 9700, 9500 Pro, and 9500. But take our advice and stick to the 9700 Pro if it's performance that you're after. Hercules, Gigabyte, Crucial,

and, of course, ATI all offer boards for \$399. Dig around and you might save a few bucks here and there. Different software bundles are the only distinguishing features between them, except for Tyan's Tachyon G9700 Pro, which comes with a proprietary heatsink/fan, which the company claims will allow overclocking of the core to 400MHz. But if you are already throwing down \$399 on a 3D accelerator, why not push the boat out another \$100 and get the All-In-Wonder 9700 Pro so that you don't need multiple PCs: one for gaming, one for work, one for video-editing, and one for TIVO/VIVO.

Half past R300. If you fancy waiting for NVIDIA's NV30, you might consider waiting a bit longer. ATI's R300 should be getting a "refresh" of its own where technology is concerned. Q2 2003 could see a die shrink from 0.15-micron to 0.13-micron, which will allow ATI to up the engine clock. Then there is DDR-2 and GDDR3, which are not too far away (DDR-2 early 2003; GDDR3 late 2003). To stay competitive with NV30, a new

9700 PRO & TI 4600 COMPARED

	Radeon 9700 Pro	GeForce4 Ti 4600
Die Size	0.15	0.15
eClock	325MHz	310MHz
AGP	8X	4X
AGP Bandwidth	2 GBps	1 GBps
Memory Interface	256-bit DDR	128-bit DDR
Memory Bandwidth	19.2 GBps	10.4 GBps
Memory Speed	310MHz	325MHz
Vertex Shader Engines	4	2
Pixel Pipelines	8	4
Textures Per Pass	16	4
Transform Rate	325 million triangles per second	136 million triangles per second
Pixel Fill Rate	2,600 megapixels per second	1,200 megapixels per second
Anti-Aliased Fill Rate	15.6 billion AA samples per second	4.8 billion AA samples per second

R300 on 0.13-micron with DDR-2 might just do the trick. But if you just can't wait and want something right away, for all current games, there is only one winner, and if current benchmarks and best available visual quality are important to you, then the 9700 PRO fits the bill perfectly.

Almost NV30

NVIDIA's challenging transition from 0.15-micron to 0.13-micron technology is about to bear fruit, and with the faint flavor of an old friend. Sometime in early 2003, NV30 will be the star attraction of NVIDIA's next-generation graphics technology, which is *not* called GeForce5, but GeForce FX: "FX" as in movie special FX, and FX as in 3dfx. NVIDIA's nostalgic tip of the hat to graphics-rival-turned-fire-sale-acquisition is also an acknowledgment that NV30 is the first product to arise from the collaboration with former 3dfx and GigaPixel engineers and technology. This is a sweet gesture and a smart marketing story.

Initially aimed squarely at the enthusiast market with NV30, more NV3x products will quickly trickle down into other market segments. NVIDIA claims remarkable scalability levels for the architecture—and the phrase "within weeks" was bandied about regarding the achievable transition time to a mobile NV3x product. This slashes the 18 months it usually takes the technology to migrate across platforms. Thus GeForce FX is set to take full advantage of DirectX 9 and braced to confront ATI's R300 head-on.

Specs & Bits

The 0.13-micron TSMC copper process with smaller and faster transistors means higher clock speeds and lower power requirements. With NV30 set to debut at 500MHz on a 125-million-transistor (15 million more than the R300, but who is counting?) packed flip chip, a hefty cooling solution is also on-board. FX Flow is NVIDIA's proprietary thermal

management system featuring some fancy heat pipes and a racy curved transparent housing (on the prototype, anyway) that just begs for neon. Power requirements were originally reported to be "within AGP power budget," but NVIDIA now confirms that GeForce FX does require an auxiliary power supply like ATI's 9700 Pro. GeForce FX also requires an extra slot. The board with cooling solution is a double-wide, mounting in your AGP slot and covering access to your first PCI slot, as well. This is not a problem for those of you with more PCI slots than you know what to do with, but is mighty inconvenient if you are already using all of them.

Memory. The NV30 boards were designed to use new DDR-2 memory and will debut with 128MB of 2.0ns clocked at "over 500MHz" ($500\text{MHz} \times 2 = \text{effectively over } 1\text{GHz}$). Coupled with NVIDIA's continued use of a 128-bit memory interface, these numbers are both above and below ATI's best. Although ATI has issued a press release stating its engineers were the first to demo a graphics board powered by DDR-2, current ATI products still utilize DDR memory. On the flip side, ATI already has a 256-bit memory interface and will likely switch to DDR-2 sometime in early 2003.

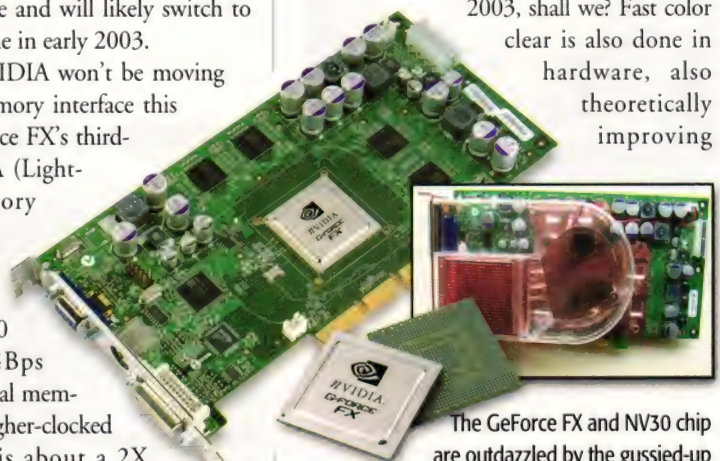
Although NVIDIA won't be moving to a 256-bit memory interface this go-round, GeForce FX's third-generation LMA (Light-Speed Memory Architecture) should compete favorably with the 9700 Pro's 19.2GBps bandwidth to local memory due to the higher-clocked DDR-2. This is about a 2X improvement over GeForce4 Ti 4600's 10.4GBps peak and should help make the addition of bandwidth-hungry 6XS and 8X multisampled AA modes actually usable. The same can be said for the improved anisotropic filtering performance. One of the main reasons the 9700 Pro trumped GeForce4 Ti 4600 was the large memory bandwidth advantage ATI held. But now each camp will be similarly armed,

and it will come down to efficiency. Thus with NV30's additional memory bandwidth, comes a mixed grill platter of efficiency technologies collectively dubbed...

Intellisample uses 5:1 marketing compression and includes new features that make the NV30's architecture more efficient than NV25's, providing a platform for plusher visuals using sophisticated compression and anisotropic and trilinear filtering.

The GeForce FX architecture sports hardware-implementation of a 4:1 ratio lossless data compression for color information. Lossless means there is no image quality degradation or precision problems, which can be issues when lossy compression techniques are used. The technology is seamless in applications, with compression and decompression occurring transparently in real-time. Compression enables more efficient anti-aliasing (AA), which means less memory bandwidth sucking and generally improved performance when AA is turned on. NVIDIA's claim that "all modes of anti-aliasing are free—without any associated loss of performance" is an extremely bold statement, so we'll reserve judgment until we have a board that is running 8X

AA in Unreal Tournament 2003, shall we? Fast color clear is also done in hardware, also theoretically improving



The GeForce FX and NV30 chip are outdazzled by the gussied-up heat pipe prototype cooling system.

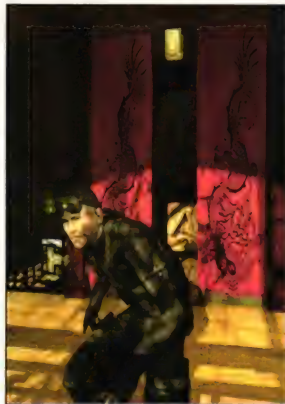
efficiency. This kind of new efficiency coupled with mega-mouth bandwidth opens the door to some new and improved multi-sampling anti-aliasing modes, including 6XS in D3D and 8X for both OpenGL and D3D apps. 4X was really the max playable with NV25, but GeForce FX can calculate twice as many samples using 8X.

Anti-aliasing is only half the story. When comparing NV25 to R300, another NVIDIA sore spot shows up: lackluster anisotropic filtering performance. GeForce FX's Intellisampling picks up the ball from ATI's R300 adaptive texture filtering techniques and runs plays of its own. NVIDIA's new GPU will monitor geometry and texture content while you're playing a game and make tradeoffs between performance and visual quality (AI, if you will) on the fly, keeping frame rates consistently peppy. It does this right down at a per-pixel level, adjusting for the number and types of samples for texturing operations used in-game. The AI's algorithms can select texel and filter levels for anisotropic and trilinear filtering, which traditionally bottleneck graphics cards at the best of times. If you're driving at 300mph, what's the use of having your GPU waste resources on 16X anisotropic filtering for spectators' hair that you can't and don't need to see anyway? It makes more sense to drop the levels down. The same can be said for trilinear: The drivers will enable you to override the adaptive filtering and choose for yourself. If you think you're more clever than the algorithms, you can give it a try.

Another potentially nifty ingredient within Intellisample is NVIDIA's Dynamic Gamma Correction, which releases game developers from having to mess with gamma spaces. The end result should be gamma-corrected images that have the proper amount of luminance and could be handy down those dingy looking corridors in FPS games. But trying to get artists not to mess with light levels is a bit like asking them not to choose colors; maybe they don't want *that* much release.

Shaders. According to ATI, "Vertex Shaders are used to modify the geometry or shape of 3D objects and also to control lighting and shadows. Pixel Shaders manipulate the color and appearance of surfaces." That sounds pretty simple, but the impact of massively programmable shaders is

profound, and even though ATI's hardware has supported DirectX9 2.0 Pixel and Vertex Shaders for a while now, there wasn't a whole lot of noise about it because there were no publicly available drivers and no demos to really show it off. Now that there is competition (at least on paper), the shouting has begun. NVIDIA's 2.0+ Vertex and Pixel Shaders are being pitched as more capable than ATI's 2.0.



GeForce FX shows off its lighting capabilities in Splinter Cell.

When asked about memory bandwidth, one of the few specs not on early release, NVIDIA commented: "... for next-generation content that becomes more shader-bound, memory bandwidth will be less useful as an indicator of the quality of the user experience." To put it another way, powerful new tools and technology that enable massive shader programs with thousands of instructions are set to overtake

memory bandwidth and become the source of the next big ... bottleneck! Once programmers and artists start playing with that many toys and gamers get a peek at what is possible, there will be no going back. So implementation will be very important.

The GeForce FX pixel fill rate is one thing, but 128-bit color-capable pixel shading is another. Increased precision with CineFX lets developers make full use of 16-bit and 32-bit floating point formats (FP16 and FP32). FP32 will obviously yield the best-looking results via full 128-bit precision through the entire pipeline but at what performance cost? NVIDIA has anticipated this probable heavy frame rate impact by including the FP16 format to balance things out with better performance at the cost of slightly less precision. Slightly less precision means the same format that ILM and PIXAR (NVIDIA's favorite whipping boys) use in movies. In addition, developers can migrate back and forth from FP32 and FP16 within the same shader program, customizing for those effects that truly require the extra precision.

The GeForce FX vertex processing power is immense. The theoretical number of total

instructions is 65,536, up from GeForce4's 128, thanks to data dependent branching and more registers, constants, and static instructions. Better flow control is on tap, with dynamic loops and branches that allow for forward and backward changes in flow. Call and return are new to the architecture, as are per-component condition codes and write masks. Branching, high-precision trigonometric functions, and high-precision exponential and logarithmic functions are new and will offer things like more flexible matrix palette skinning for characters.

Pixel Processing is also upped a notch with CineFX, so hopefully developers will come out with some innovative effects. A new instruction set is present for pixel shading that roughly matches what was previously available for vertex processing. Programs can be longer; as high as 1,024 instructions and pixel operations with as many as 16 textures per pixel with copious amounts of dependant texture performance. Per-component swizzling and per-component conditional write masks are just some of the newly available toys. New pixel operations include soft shadows, frame buffer post-processing effects, and more complex filters. That's the theory. In practice using all this should be tough on performance, but NVIDIA claims to have enhanced fragment program storage, where it is stored in video memory. This is all really great stuff and looks to be leaving ATI somewhere in the dust. But looks can be deceiving.

Shady Instructions

The shader instruction numbers from official NVIDIA sources have scooted around a bit since our NV30 CineFX sneak (Sept. *CPU*, page 19). Changes in final DX9 specs is NVIDIA's explanation for the drop from 1,024 to 256 max static instructions and the elevation from 64 to 256 max loops for vertex shaders in its revised specs chart. The revised numbers do still arrive at the impressive (and widely publicized) 65,536 max instructions. (1,024 static instructions X 64 loops is now 256 static instructions X 256 loops.) There is nothing

particularly odd about specs changing before a launch, especially when so much of the technology is very new, but it got us thinking about ATI's R300 specs, too. The 9700 Pro came out months before DX 9 release candidate zero, with not much detail. "DX9 Vertex Shaders" included 1,024 instructions, 256 constants, and "yes" for flow control. We needed to know what else was under ATI's hood. Meanwhile, NVIDIA had moved the marketing bar up by itemizing features more precisely in pre-COMDEX briefings and printing its internal lab findings of ATI R300 specs alongside those of the NV30. Even NVIDIA admits that those findings are limited to what is exposed in available drivers, which won't necessarily reveal all the hardware's capabilities. So, in the interest of fairness (we are, after all, taking NVIDIA's word for what its hardware can do), we have included R300 shader numbers, as reported to us by ATI, that include yet-to-be-exposed additional capabilities and put them alongside NVIDIA's representation of both R300 "as it sits today" and NV30 potential. (See "Shader Comparison" chart.)

As you can see, ATI's reported vertex shader capabilities are right up there with NVIDIA's. ATI's 255 max loops and 256 static instructions should deliver 65,280 max instructions, though ATI modestly stated "approximately 65,000" for our chart. We do, however, see significant differences in pixel shader support, with NVIDIA leading the way toward (though not fully supporting) Pixel Shader 3.0, expected to arrive with DX9.1. Although we expect NVIDIA to support its full feature set at launch, ATI will have added some additional support before year end, with more planned for Q1. When we have actual hardware, we'll perform our own tests and revisit these issues.

Cg. Meanwhile, NVIDIA released (ahead of the hardware) its full list of NV30 OpenGL Extensions and a downloadable NV30 software emulator to jump-start development. Used in conjunction with NVIDIA's high-level shading language Cg (see Sept. *CPU*, page 42), the emulator employs the CPU to create the visual results that will eventually come from NV30, but of course, a lot more slowly (usually measured not in fps but in seconds per frame).

Precision, Pipelines & Movies

Along with increased shader programmability, the features with the most visual impact for developers (and eventually for users) have to do with color dynamic range and accuracy because copious amounts of shader instructions reap little benefit if the end result is inaccurately rendered. Until ATI's R300 and now NVIDIA's NV30, color for PC games was limited to 32-bits total or 8-bits each for red, green, blue, and alpha (transparent). Although this allowed for a lot of colors, if your scene was predominantly made up of one color range, for example, an ocean and sky, you were limited to 256 shades of blue. This is not the best way to view nature. Now that 128-bit color is on board, the sky is no longer limited. But which implementation of this visual bounty will provide the best user experience is what you really want to know.

The GeForce FX boasts high precision "studio quality" 128-bit floating point color in all its end-to-end 128-bit pixel processing pipeline glory. This goes beyond DX9's requirements for 128-bit input and output stages and bests ATI's pixel pipeline, which drops down to 96-bit (24-bit per component) for other than some 128-bit texture sampling stages. NVIDIA sites numerous examples in its High Precision Graphics technology brief of when and how that drop can adversely affect final output results.

So ATI seems to have answered the call of Carmack for minimum 16-bit

floating-point color support throughout the graphics pipeline (24-bits preferred), while NVIDIA was matching the challenge tossed out by the film industry. Here is where we finally get to that movie stuff: The biggest marketing message for GeForce FX is true cinematic effects capabilities. Not an approximation or something close, but actual film quality and formats. NVIDIA has always stated its ultimate goal clearly, it wants to "own every pixel on the planet." GeForce FX takes the company another step closer with film and television special effects and the animated feature market. But in a difficult stock market and facing a missed Christmas season, it is also true that film is a much easier mass market message than high-end gaming.

What To Do Now...

Not getting the NV30 by the end of 2002 leaves some interesting dilemmas. If you want to upgrade from a DX6/7-class product and want it right now, the 9700 PRO fits the bill perfectly. Not only is it the best DX8 performer around, but it also is the first DX9-class board to boot. If you have a GF4 Ti 4600, it's probably prudent to wait and see because you are accustomed to using NVIDIA hardware already, and chances are that GeForce FX is going to be faster than 9700 Pro if the paper specs come through. It won't be long now, so it's probably worth waiting before jumping from DX* to a DX9-class product.

SHADER COMPARISON

	ATI R300 (source ATI)	ATI R300 (source NVIDIA)	NVIDIA GeForce FX (source NVIDIA)
Vertex Shader Version	2.0 *	2.0 **	2.0+***
Max Instructions	≈ 65,000	1,024	65,536
Max Static Instructions	256	256	256
Max Constants	256	256	256
Temporary Registers	32	12	16
Max Loops	255	4	256
Pixel Shader Version	2.0 *	2.0 **	2.0+***
Texture Maps	16	16	16
Max Texture Instructions	32	32	1,024 (b)
Max Color Instructions	160 (a)	64	1,024 (b)
Max Temp Storage	32	12	64

* instructions to be exposed in future

** instructions currently exposed

*** instructions to be exposed at launch

(a) 32 texture, 64 vector + 64 scalar

(b) total of 1,024 either/or combination

My Account

WELCOME, MIKE ALLEN
STATUS: GOLD
MILEAGE BALANCE:
136,357

Net SAAver Alerts

FROM: CHICAGO, IL
TO: ST. THOMAS, VI
ON SALE

Flight Status Notification

> FLIGHT 1138
DEPARTURE GATE HAS
CHANGED TO GATE C12.

Do they know something about
air travel that you don't?

> Introducing the new AA.com

Log on to the new AA.com and you'll know how to travel in a whole new way. You'll know that the My Account feature allows you to personalize information and store travel preferences to speed booking. You'll know how to manage your AAdvantage® account and receive Net SAAver Alerts to as many as 30 of your favorite cities. You'll know that Flight Status Notification delivers the latest gate and flight time updates to your cell phone, pager, PDA or e-mail. And you'll know you can use and earn AAdvantage miles online for everything from booking flights to purchasing upgrades. But there's a lot more you'll know. So add to your knowledge base by simply logging on to the new AA.com today. **American Airlines®**

The new **AA.com** Now you know.

Shopping On A Budget

What we often forget about 3D graphics cards is that not everybody needs the fastest gun in the West, and there are other vendors than just ATI and NVIDIA. These companies grab most of the headlines because they have the top speed numbers and the largest market share, but if you're not a speed freak, check out Matrox and Trident, the two "other" board vendors.

Matrox Parhelia: The Power Of Three

Let us dispense with the bad news first. Our test results would indicate that the 128MB Parhelia isn't a speed demon. In general, the numbers run 20% to 50% below what we would expect from a similarly priced (\$399) card, such as NVIDIA's GeForce4 Ti 4600. One could argue that there's plenty of room for improvement in Matrox's drivers, and there probably is. In reality, though, most of the fault probably lies with the Parhelia's 220MHz core clock speed, which is bound to suffer compared to the GeForce4's 300MHz and the Radeon 9700's 325MHz.

But 80 million transistors can't all be wrong, and the Parhelia-512 does pack a lot of muscle in several sexy places; foremost is triple-head support. Matrox pioneered the use of dual-head technology in consumer-level cards, and now Parhelia allows for a single desktop to span three screens at up to 3,840 x 1,024 x 32. Do you really need a wrap-around desktop? Well, count the apps you typically keep open or how often you toggle them. Now imagine keeping

three to six windows viewable at all times. A desktop this huge takes some getting used to, though, and we actually ended up changing our mouse's speed settings because it took so many drags to get from one edge to the other.



Matrox Parhelia

Triple-head really shows its merits when used for Surround Gaming, as Matrox calls it. More than 30 3D games now support triple-head displays, with more on the way. Some titles only stretch the content to cover three screens. Others, such as Quake III and Unreal Tournament 2003, work in conjunction with Matrox's Apptimizer utility to expand the peripheral content being displayed. When you hear footsteps off to the side, now you can actually see the character making them.

Triple-head isn't always smooth sailing. You can run three CRTs or three LCDs (analog or DVI), but you can't mix and match because of the disparate refresh rates involved. We lit up a row of CRTs and discovered our 14-inch unit bound us to a maximum vertical resolution of 800

pixels. Going with the default 3,840 x 1,024 resolution sent the screen into a frenzy. (Fortunately, Matrox's PowerDesk utility makes short work of managing settings across all of the displays.) Our first impression of Surround

Gaming was "Dude, this is *sweet!*" mixed with a twinge of "I think I'm gonna be sick." Moving to three same-sized screens with narrow bezels helps ease the queasiness.

Is triple-head worth a \$200 premium plus the cost of one or two extra monitors? Maybe. But there's a lot more

to Matrox's story. For starters, one of the ways

Matrox can maintain its excellent scene quality under a slower GPU is its 16x fragment anti-aliasing (FAA-16x). The principle is this: Rather than follow the common path of anti-aliasing an entire scene, simply find the object edges within that scene. Edges are where we observe most jaggies, but they compose a small percentage of the total pixels. Add the Parhelia-512's ability to sample 64 textures per clock and single-pass quad texturing, and the level of realism achieved is simply gorgeous. We nearly forgot all about benchmark scores when we watched Matrox's underwater reef demo spread over three screens.

Parhelia Precision

Over a period of about the last three years, Matrox effectively swore off the gaming world and positioned itself as a business products company emphasizing dual-head displays and 2D graphics.

To seize market share from **NVIDIA** and **ATI** at a time when 3DMarks rule GPUs like megahertz rule CPUs, Matrox must substantially undercut its rivals, and that's just not happening.

What Matrox didn't grasp then was that any company wanting to build a large presence in today's small- to medium-sized business world needs to build on a reputation in the consumer world—and that means scoring wins among gamers.

However, Matrox's time spent focusing on business did yield some noteworthy design developments, primarily in the integration of 10-bit-per-channel color. If you value photo-realism and graphical accuracy, this is significant. Most display adapters handle 24-bit color—8 bits per red, green, and blue channel. Yes, your driver allows for a 32-bit color mode in the display properties, but this is actually 24-bit color with alpha information tacked on. Your photo editor probably only handles 8 bits per channel like your other apps, and most if not all of your games. Within a color channel, 8 bits can yield as many as 256 distinct shades. A 10-bit channel yields up to 1,024. Across all three channels, that's 16.8 million colors (True Color) vs. more than 1 billion. This is why Matrox calls its 10-bit-per-channel technology GigaColor.

palette that gets hacked to a fraction of itself when viewed on your monitor. For graphics professionals, this obviously presents a problem when judging color accuracy, but even graphic hobbyists and gamers feel the impact in displayed images lacking extra depth.

Combined with a 10-bit DAC, Matrox can achieve far more accurate gamma correction and thus superior color rendering. If you're used to seeing color banding, particularly in finely graded dark tones, you'll be floored when the Parhelia makes these bands vanish into naturally smooth transitions. One nice touch is Matrox's inclusion of a 30-bit color plug-in for Adobe Photoshop.

Another Matrox Parhelia technology is UltraSharp. You may have noticed how some display cards cause image jitter and ghosting, particularly at high resolutions. The problem revolves around the RAMDAC and the accuracy of the signals coming from it. A waveform of most RAMDAC signals shows a lot of squiggling at the peaks and troughs where there should be a nice, flat line. Moreover, an ideal signal should maintain a constant

intensity at a given frequency translates into poor display sharpness and color accuracy. Matrox's new filter circuitry delivers unprecedented signal accuracy

Parhelia Test Results

We tested the Parhelia on a KT400-based Gigabyte GA-7VXP with 512MB of DDR333 memory and an AMD Athlon XP 2700+ processor.

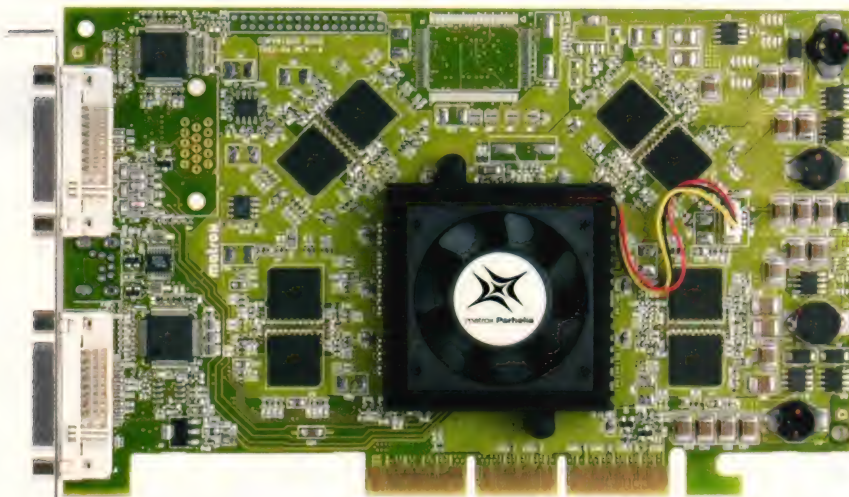
- Comanche 4 (fps): **28.46**
- Quake III Arena (fps): **139.3**
- Jedi Knight II (fps): **66.4**
- UT2003 640 x 480 flyby:botmatch: **134.356:49.473**
- UT2003 demo 1,600 x 1,200 flyby:botmatch: **90.931:39.773**
- [H]ard OCP UT2003 dm-inferno 1,600 x 1,200 low:avg:high: **11.638:65.148:506.840**
- 3DMark 2001 SE: **8,227 marks**

for hi-res output, regardless of whether you're displaying on DVI, analog, or TV screens (via the included composite and S-Video pigtail).

Not least among the Parhelia's attributes is its Glyph Anti-aliasing for fonts. Font anti-aliasing is nothing new. Win2000 and XP even build the capability in so on-screen text looks jagless and smooth. But performing text anti-aliasing in software takes a toll on system resources. Matrox not only offers text anti-aliasing in hardware, but also performs gamma correction on the text. Anti-aliased pixels are rendered in a state of semitransparency, blending the text's color with that of the background. However, default gamma correction often results in erroneously colored opaque pixels. Matrox's gamma correction fixes this and makes for more comfortable on-screen reading.

Strong Fighter, Uphill Battle

Parhelia's other gems include the card's 10-bit color support meshed with the integrated NTSC/PAL encoder, delivering stellar TV output and DVD playback.



Matrox Parhelia-512

The sticking point is that your scanner probably captures 36-, 42-, or 48-bit color. More high-end digital cameras are now supporting 14-bit-per-channel color. You have this tremendously rich color

intensity throughout the 360MHz or so of a RAMDAC's frequency range. The inability of the RAMDAC's filters to accurately hit these high and low frequency points or to reach the signal's full

Trident needs a **can't-lose product** that will capture of those building mainstream PCs.

The XP4 needs to **outperform** every integrated graphics chip (namely NVIDIA's nForce and ATI's IGP) and **fulfill its pitch promise**.

Two DVI ports are provided rather than the usual one, plus an analog port. CAD users will love the performance boost from Matrox's bundled PrecisionCAD drivers, and WYSIWYG drivers for After Effects and 3ds max let you use a TV as the third display and preview straight from the DCC (digital content creation) application while still enjoying DualHead functionality on two CRTs or LCDs.

Unquestionably, the Parhelia has a lot going for it, and Matrox's engineers deserve ample praise for their devotion to quality. Now the company needs to find a target market. The Parhelia is a no-brainer for those wanting a three-display desktop. Graphics professionals who don't need industry-leading performance rates (and that narrows the field, doesn't it?) will also want to consider a Parhelia.

But what about consumers? The GeForce4 Ti 4600 and even the Radeon 9700 Pro are cheaper and substantially faster. To seize market share from NVIDIA and ATI at a time when 3DMarks rule GPUs like megahertz rule CPUs, Matrox must substantially undercut its rivals, and that's just not happening. Matrox doesn't even bundle a single full version of a Surround Gaming-enabled title. This is a worthy product that deserves a wider audience, but Matrox has to make that

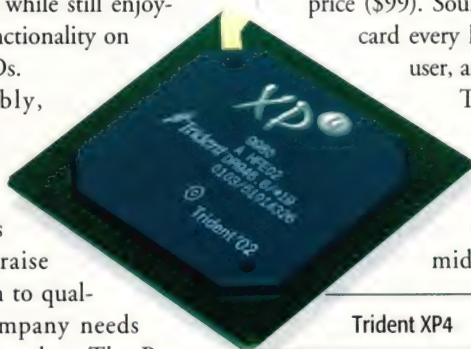
happen. Otherwise, this will be one of the shortest-lived comebacks the graphics market has ever seen.

Trident XP4: Seize The Average

Here's the pitch: Trident's new XP4 will deliver 80% of the performance of a GeForce4 Ti 4600 for one-third of NVIDIA's price (\$99). Sound good? Sound like a

card every high school kid, home user, and office worker needs?

Trident hopes so. The company that practically created the graphics market in the early- to mid-'90s now ekes out a



Trident XP4

living in cheap notebook and OEM card chips. There's a lot of volume in these segments but not a lot of dollars.

Trident needs a can't-lose product that will capture the attention of those building mainstream PCs. The XP4 needs to outperform every integrated graphics chip (namely NVIDIA's nForce and ATI's IGP) and fulfill its pitch promise. With that done, the unavoidable question is: Why *wouldn't* four out of five mainstream buyers take one home?

Much to Trident's credit, it went out on a limb by sending us the first XP4 card ever reviewed. The card came with several warnings about how the drivers had been optimized for DX8.1 because that's where most of today's gaming action is. OpenGL optimization will come later as the product gets ready for mass production. We went through two cards and two sets of drivers

before Trident asked which motherboard we were using. It turns out the KT400 is the one chipset Trident hasn't tested with yet, so Trident sent us a preconfigured KT266-based system for testing.

We leaned on Unreal Tournament tests for our evaluation, hoping to emphasize the XP4's DX8.1 drivers. We weren't surprised at the pitiful scores in Comanche 4, Quake III, or Jedi Knight II. (OK, maybe a little surprised.) The 3DMark scores were acceptable for a mainstream card, although still only 50% to 60% of what we've seen from Ti 4600 tests. But the UT benchmarks, which the XP4 should have aced, were abysmal. The 64MB card limped through low-res testing but was outright crushed as we increased the resolution to 1,600 x 1,200. As of mid-November, it seems increasingly unlikely Trident will have its drivers in shape for a holiday season release, and that's not good.

The Best-Laid Plans

The theory behind the XP4 looks compelling. The graphics core sports only 30 million transistors—less than half that of a GeForce4 Ti—which helps contribute to the low price tag. And like the GF4 Ti, the XP4 features four pixel-rendering pipelines. However, whereas most chips use identical logic structures for each pipeline, Trident uses resource sharing in

XP4 Test Results

We tested the XP4 on a KT266-based Gigabyte GA-7VTXE with 256MB of DDR266 memory and an AMD Athlon XP 2400+ processor:

- Comanche 4 (fps): **22.17**
- Quake III Arena (fps): **92.3**
- Jedi Knight II (fps): **20.2**
- UT2003 640 x 480 flyby:botmatch: **65.502:28.591**
- UT2003 demo 1,600 x 1,200 flyby:botmatch: **16.144:10.130**
- [H]ard OCP UT2003 dm-inferno 1,600 x 1,200 low:avg:high: **0.905:8.808:474.275**
- 3DMark 2001 SE: **6,582 marks**

each successive pipeline to help distribute the load. The second pipe has fewer transistors than the first, the third less than the second, and the fourth less than the third. The larger pipe assists in doing the work of its neighbor. Four pixels emerge with each clock cycle, but the overall performance is less than what four dedicated pipes can deliver.

There will be three XP4 cards, all AGP 4X. All three use a 500MHz memory bus, but the T3 (\$99) features a 300MHz core and 128-bit bus while the T2 (\$79) carries a 250MHz engine and 128-bit bus and the T1 (\$60) only offers a 250MHz engine and 64-bit bus. The T1 and T2 integrate 64MB of DDR memory; the T3 can deliver 128MB or 256MB. The engineering samples Trident provided us were T2s.

The XP4 runs on only 3W to 4W, which is extremely low. (In fact, as Trident prepares to release a mobile incarnation of the XP4, we can't help but wonder if the desktop product is merely a warm-up for the power conservation-minded notebook space, which is really Trident's forte.) The card's backplane features DVI, analog, and S-Video connectors, and a 420MHz RAMDAC provides up to 2,048 x 1,536 resolution. The video driver appears to support dual output, but when we plugged a flat panel with a DVI-to-analog converter into the DVI port, there was no output signal, perhaps signaling one more to-be-implemented feature.

Unless Trident can pull off a miracle with its final design and software, it seems unwise to position this card as a GF4 Ti-killer. Set against a GeForce4 MX, it may have a fighting chance, but then the XP4 would lose its value proposition. We hope Trident can deliver on its 80% promise, but we'll have to wait for the final release to find out.

On The Workstation Front

There are those who play, and there are those who create when they're done playing. Essentially, this is the difference between a workstation graphics card and a performance consumer card. Quite

often, the graphics cores are the same. The NV18GL chip that powers NVIDIA's 580 XGL low-end workstation card is a slightly beefed-up version of the NV18 that powers the AGP 8X flavor of the GeForce4 MX 440. Likewise, ATI's FIRE GL X1 card uses what is basically a Radeon 9700 core.

The price is one obvious difference between workstation and consumer cards. The 580 XGL, for example, lists for \$325 (NVIDIA predicts about \$225 for a street price), while the GF4 MX 440 hovers around \$80. The difference is in how the product is optimized. A consumer card is geared to handle practically any application its driver can recognize. Workstation cards preserve this universality, but further enhancements are made to address the needs of professional digital creation tools. Sometimes there are modifications in hardware, but

that require stability maybe more than speed. Software certification means that a graphics card has been thoroughly tested and has no technical issues running a given application. Without a 3ds max certification, for instance, many DCC professionals wouldn't dream of pairing their multithousand dollar title with a particular card.

Not all professional apps carry steep price tags, though. AutoCAD LT now sells for only \$725, and many Flash development tools fall well less than \$1,000. As such, an increasing number of hobbyists and amateurs are taking their love of high-end graphics and moving into design. The two cards we reviewed are aimed at the low end of the workstation market. These users don't necessarily have businesses riding on their workstation cards, but they need more speed and stability than a consumer product can offer.



3Dlabs Wildcat VP560

the bulk of changes tend to appear in the card's drivers.

Also at stake is professional certification. There are two general application types for graphical workstations: CAD (computer-aided design) and DCC (digital content creation). On the CAD side, some big names include Autodesk AutoCAD, Dessault CATIA, and SolidWorks. DCC apps include Alias|Wavefront Maya and Discreet's ever-popular 3ds max. However, these are large, highly resource-intensive programs

Workstation apps will run on consumer cards, but the demands of many workstation titles will swamp a consumer-based system so much it will become unusable.

3Dlabs Wildcat VP560: Big Roar, Big Value

The computer industry tends not to be kind to companies that work outside of convention. The public still isn't sure what to make of AMD's performance-based naming system, and Rambus' attempt to turn the tide of high-end

desktop memory sunk like a rock. In high-end graphics, there's no denying that NVIDIA rules the roost and in some cases has the power to guide the market. When NVIDIA designs its programmable pixel pipeline a certain way, the application developers code for that method and—in order to be compatible with what's on store shelves—competing vendors have to accommodate the same design even if they have superior approaches.

But there's a difference between accommodating an industry standard design and being bound by it. A GPU handles a relatively static set of tasks compared with a CPU, which is highly programmable and designed to accommodate practically any task you throw at it. To apply the same degree of flexibility to visual scenes, 3Dlabs reasoned that a VPU (visual processor unit)—a chip with highly programmable shader support—was necessary. 3Dlabs could take NVIDIA's GPU and build a whole additional level of programmability on top of it.

After two years and more than \$20 million in R&D, the result is the P10

chip, which now powers the Wildcat VP 760, 870, and 970. At the entry level, though, 3Dlabs held back for a few months, knowing it had to beat NVIDIA in the sub-\$300 category to have a prayer at gaining a foothold in the low end. The

Wildcat VP560 Test Results

SPECviewperf 7.0

- 3dsmax-01: **5.757**
- drv-08: **42.41**
- drv-08: **50.1**
- light-05: **13.7**
- proe-01: **11.27**
- ugs-01: **8.378**
- SPECapc graphic mean : overall geometric mean: **1.68 : 1.43**

company went for a scaled-down array architecture in the vertex and pixel pipelines without sacrificing any of the P10's programmability. Although this does entail a performance hit, there's no loss of functionality or flexibility, and the end result is a very versatile chip with the ability to accommodate the OpenGL 2.0 shading language when it arrives.

With a high estimated street price of \$249, the 64MB VP560 features a DVI, analog, and S-Video connector. Full dual-head display is supported (3Dlabs will supply an HD-to-analog adapter on demand at no charge), and the Acuity drivers are comprehensive. We did notice some anomalies at a couple points, such as several desktop distortions prior to loading the Acuity drivers, and 3ds max often appeared to stall during shutdown.

In SPECviewperf 7.0, the battle between 3Dlabs and NVIDIA is a see-saw affair, and users should study the results to see which card excels in their particular application. The VP560's performance in UGS' Solid Edge CAD application is especially strong. Where we saw the most striking fall-off was in 3ds max, both in the viewperf and apc tests, as well as the Lightwave test. NVIDIA emerges as the leader in DCC tools, a conclusion also borne out to a lesser degree by results scores on SPEC's site.

Keep in mind, though, that NVIDIA has had a lot more time to refine its Quadro line than 3Dlabs, and there's still room for improvement in the P9 and

GOING MOBILE

If your idea of notebook graphics falls somewhere between a pie chart and Space Invaders, take note: The world has moved on. Practically every GPU and mobo chipset vendor is racing like mad to bring desktop-class 3D capabilities to mobile PCs, and most have done a fine job. If you're looking at snagging a new notebook, check out these latest chips to make sure your next portable has the graphics power you need.

Three Paths, Four Players

In notebook graphics, chips come in one of three ways: discrete (as a separate part from the chipset and video memory), MCM (Multi-Chip Module, with

memory packaged onto one chip alongside the graphics core), and fully integrated (where the graphics core is built into the chipset's North Bridge). As chips become more integrated, their footprint and cost goes down, but in general, so does overall performance.

ATI. With the release of Mobility Radeon 9000 (M9) last August, ATI not only trounced its own preceding M7 product but blew every other mobile graphics chip out of the water. The M9 is based on the same core as the desktop Radeon 9000, meaning you get full DirectX 8.1 support in hardware backed by 64MB of graphics memory. The chip handles vertex and pixel shaders in

hardware, delivering the best mix of speed and realistic 3D images to date in a mobile PC.

ATI has beefed up the M9 with top-notch power-saving features, MPEG-2 decoding, multiple-display HYDRAVISION, and a versatile set of anti-aliasing functions that improve streaming video and help smooth out zoomed text, plus help to deliver photo-quality 3D presentations.

ATI reportedly controls about 60% of the mobile market, based largely on the aging but still respectable M7. For even more power than the M9, keep an eye out for a product based on the Radeon 9700 core to debut shortly.

NVIDIA. Strangely, NVIDIA didn't get into mobile graphics until the GeForce2 Go (a GeForce2 MX with power-saving features) in November 2000. In February 2002, NVIDIA followed up with the GeForce4 Go, which comes in three GF4 MX knock-off versions: the 420, 440, and 460.

NVIDIA has scored several design wins with the GF4 Go. Previous to the M9, this was the mobile chip to beat. The chip has superb power-conservation features, multidisplay nView support, desktop-class anti-aliasing, and some of the best DVD playback hardware available anywhere. Cool perks include the ability to optimize the

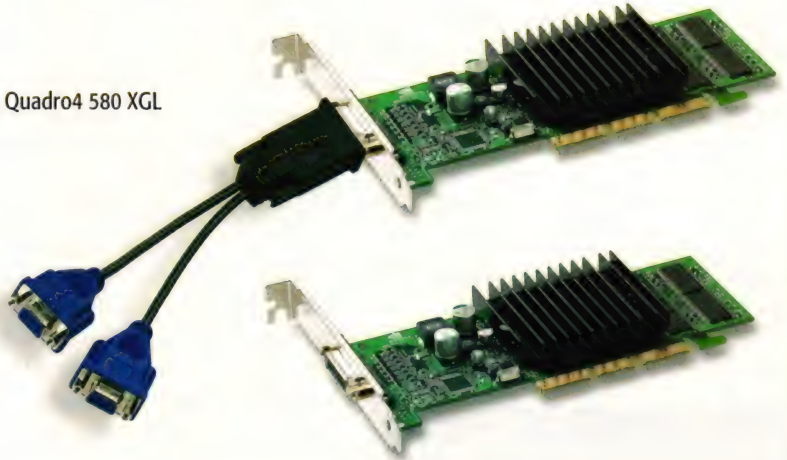
P10 designs. In fact, with Creative Labs now in control of 3Dlabs, count on seeing 3Dlabs given the resources it needs to capitalize on its strong R&D and also the ability to quickly move the technology into consumer segments. We expect great things from 3Dlabs in the next couple of years. The Wildcat VP family holds a lot of promise, and with luck the rest of the industry will take the P9/10's programmability message to heart.

NVIDIA Quadro4 580 XGL: Not Another GeForce

Most of the Quadro's history has been spent being little more than an overclocked GeForce. In a move that harkens back to the 486SX, some Quados did offer features not found in the GeForce line, but only because those features were disabled in the consumer product. The situation is a bit different today, and the Quadro4 has a larger die and higher transistor count than its GeForce cousin.

Some sources will tell you that today's high-end consumer cards are sufficient for workstation apps and that a high-end GF4 Ti can outstrip a low-end Quadro.

NVIDIA Quadro4 580 XGL



To test this, we ran an MSI Ti 4600 card through SPEC's viewperf 7.0 alongside the Quadro4 580 XGL, which features only 64MB of 128-bit DDR memory. The performance gap between the cards is obvious despite the fact that the Quadro is pitting its MX-class core against the flagship Titanium. Now, viewperf is designed to test 3D rendering under OpenGL, so it's not the last word in assessing total performance. Switching over to our benchmarks under conventional games, the 580 GXL performs

much more in line with what we would expect from a GeForce4 MX (a bit better, actually), and the Titanium reasserts its dominance.

Inside The Quadro4 XGL

The Quadro4 XGL line divides into two markets. The 700- and 900-series cards serve the mid- and high-end workstation crowd while the 300- and 500-level cards handle the entry level. Most recently, NVIDIA refreshed its XGL lineup for the AGP 8X generation.

display for various lighting and viewing conditions.

What the 4 Go forgot was hardware-based DX8 support. According to Bill Henry, NVIDIA director of mobile product management, "We'll basically bypass DX8 and go straight to DX9. That'll be in the first quarter of 2003." Also due for inclusion are hardware-based vertex and pixel shaders.

S3 Graphics. S3 built its name in mobile graphics by targeting mainstream and low-end users. In fact, according to Dr. Gerry Liu, S3's vice president of marketing, the company pioneered the use of MCM architecture in notebooks. Today, S3's integrated ProSavage parts still top out at

PC133 SDRAM-class technology, making them suited for little more than budget notebooks.

The situation improves with S3's latest discrete flagship, the Alpha Chrome, also called the SavageXP. Although texture data is still handled through system memory, the chip does provide second-generation hardware T&L (transform and lighting), hardware MPEG-2 decoding, and dual-display output, making the Alpha a decent mainstream chip. In the first half of 2003, watch for S3's Delta Chrome, which will support DirectX 9, HDTV, and several low-power features while still targeting the value market segments.

Trident Microsystems. A decade ago, Trident ruled the graphics world. However, intense competition forced the company into mobile graphics, where it led the charge into integrated video North Bridges. Trident continues its integrated legacy with the CyberALADDiN and CyberBLADE chips, low-power chips aimed at inexpensively powering notebooks used for such tasks as DVD watching and DirectX 6/7-generation gaming.

As you read this, the XP4 chip, which will come in discrete and MCM versions, should be available. Trident maintains the XP4 will provide the lowest power consumption

of any mobile graphics chip while still delivering DX8.1 support in hardware.

Choose Wisely

Although all four companies would have you believe they'll be offering high-end graphics chips by mid-2003, we're only banking on ATI and NVIDIA as being suited to power users. The significant question is whether S3 and Trident, which power scores of mainstream models, will be ready to handle next-gen, 3D-intensive OSes like Microsoft's Longhorn. The odds look good, but watch for reviews of the chip in your next prospective notebook before buying. ▲

The NV17GL chip found in the 550 XGL card is now the NV18GL in the 580 XGL. We can expect the step up to 2.1Gbps to bear a bit more fruit in the workstation market than the meager 2% or so realized thus far in consumer software, but the NV18GL is definitely a minor evolution and nothing to hold you back from grabbing a clearance deal on a 550 XGL.

The card itself is very low-profile with only one HD connector. Considering the

Quadro4 XGL Test Results

SPECviewperf 7.0

- 3dsmax-01: **10.19**
- drv-08: **38.72**
- drv-08: **47.21**
- light-05: **21.09**
- proe-01: **10.92**
- ugs-01: **6.464**
- SPECapc graphic mean : overall geometric mean: **5.94:3.83**

compact form factors gaining popularity in offices and the crossover between design and marketing in many companies, a small card for basic workstation use makes good sense. NVIDIA includes two pigtail splitters, one for dual-analog displays and one for dual DVIs. As with all modern NVIDIA cards, the drivers are comprehensive, but now rather than populating the Properties screen with a bevy of tabs, NVIDIA shows only one Quadro4 tab. A fly-out window attaches to the Properties box, and the item you select from its menu (nView mode, Direct3D settings, overlay controls, etc.) determines the contents of the Properties box window.

One of the key differences between the NV18GL and NV18 is support for programmable shaders. Another is full hardware support for DivX 8.1. The Quadro line has always distinguished itself from consumer cards by offering anti-aliased points and lines, and the latest AA engine makes this feature better looking than ever. As with the Matrox Parhelia's edge anti-aliasing, line and point AA makes huge sense for accelerating CAD applications. Who needs full scene AA when your image is just a collection of lines?

Clip regions are another area where the 580 XGL shines. When a single window sits on the desktop with no other windows overlapping it, all the contents of the color buffer can be dumped to the frame buffer at once. With overlapping panes, however, the display must be broken into clip regions, or blocks, that get processed individually. In games, these overlays aren't much of a problem because most titles don't have pop-up windows. But in a program such as Maya, each palette that sits on the interface is an overlapping 3D window. The GeForce handles one clip region in hardware and the rest in software. With enough overlays on-screen, system performance takes a real dive. The Quadro4 XGL handles up to eight overlays in hardware, substantially improving window- and palette-heavy programs.

CAD designers will also benefit from the Quadro4 XGL's hardware support for clip planes. When looking at a complex object like an engine or a building, you often want to be able to see inside the object. The "window" you cut into the exterior is called a clip plane. As you might expect, lack of hardware acceleration for clip planes can take a heavy toll on professional design packages, although not all CAD titles support clip plane definition.

The 580 XGL sports two rendering pipelines and dual 350MHz RAMDACs. Each display can run up to 2,048 x 1,532 x 32, and the card features NVIDIA's Lightspeed Memory Architecture II and nfiniteFX II Engine, just like the Titanium cards. The nView multidisplay utility set is here, too, and new innovations such as flat-panel monitor rotation and transparent windows will find a lot of fans among professional users.

If you were just buying a card for workstation use, it would be a tough fight between the Quadro4 580 XGL and 3DLabs' Wildcat VP560. But bring the ability to run consumer apps and games into the equation and ruling in favor of NVIDIA becomes unavoidable.

ATI's FIRE GL X1

We kept hoping ATI would have its X1 ready for review for this article, but it wasn't meant to be. The card was due in October and, as of this writing, still hasn't

shipped. ATI isn't discussing a firm price yet, but don't be surprised to see something in the \$899 ballpark.

In theory, the X1 should do in the workstation space what the Radeon 9700 did for gaming cards, in part because the X1 is a revamped R300 core. The X1 boasts eight pixel-rendering pipelines, 256MB of DDR, a dual-DVI connector, stereographics connector, DirectX 9.0 hardware support, twin 400MHz RAMDACs, and AGP 8X support. The X1 supports as many as 16 textures per pass via Pixel Shaders 2.0 (the 9700 uses 1.4). The card's 128-bit floating-point architecture is fully programmable. The level of color depth ATI will achieve with its 24-bit-per-color channel, however, simply boggles the mind. ATI will also throw in a new slew of shader and asset management tools, almost as an afterthought.

We mourn for this missed chance to try the X1, but we trust ATI's judgement. We all know of companies that made the mistake of releasing a product before it was ready, and an unnecessary skewering by the press does no one good in the long run. If you're contemplating a mid-range to high-end workstation card, wait and see how the X1 looks when it launches.

Pick A Card, Any Card

We'd like to leave you with some feel-good sentiment such as: No matter what type of user you are, there's a graphics adapter just for you. The odds are that there are several with your name on them.

Graphics-savvy notebook users will want a unit based on ATI's M9. For gaming speed, a GeForce FX (if it works as advertised) is the latest way to go. For immersive gaming, Matrox's TripleHead will have you reeling. For creating an all-in-one multimedia powerhouse, check out a Radeon 9700 Pro-based All-In-Wonder.

It all depends on how you use the system sitting in front of you. Fortunately, there are graphics adapters for every need, and most of them will do you proud. **cpu**

by Joan Wood & Alex Ross

(pages 50 to 54)

and William Van Winkle

(pages 56 to 62)



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The Bleeding Edge Of Software

Inside The World Of Betas

by Warren Ernst

Fortune-telling becomes an exact science when it comes to working with betas. This month we bring you four glimpses into the future of software.

File-Ex 3.0.0.18 beta

Don't you hate it when you want to open a file in a program and you can't locate it anywhere? What about when you need to rename a file or copy it or move it? Clicking Cancel and exploring your files can be a drag after you've done it for the thousandth time.

File-Ex aims to solve this problem by replacing the wimpy Open and Save/Save As dialog boxes with a supercharged substitute that works out of the box with nearly every existing program. The app also provides a simple method for working with programs that use their own dialog boxes, such as Microsoft Office 97, 2000, and XP.

File-Ex's dialog box is different than the normal ones in that it's very large and

resizable, so you don't need to scroll through a long list of files to find what you need. It also includes Delete, Copy, Move, Rename, Find Files, and New Folder buttons, so you can perform a lot of file management without leaving the program. Additionally, File-Ex provides menus that remember recently opened files and recently accessed folders. There are also two lists of your favorite files and folders.

Is File-Ex worth the registration price (about \$20)? That really depends on how you manage your files and just how much jumping out of your applications bugs you. Is the program well written, stable, and a time-saver? Absolutely. ▲

Official product name: File-Ex 3.0
Version # previewed: 3.0.0.18 beta
Publisher: Cottonwood Software
Developer and URL: Cottonwood Software; www.cottonwoodsw.com
ETA: Q4 2002
Why you should care: Replace that wimpy Open dialog box with a supercharged new one.

TaskInfo2003 5.0.0.73 beta

Not knowing what's happening inside your computer may not be a big deal if everything is working OK, but when things aren't, knowing details is important. Most Linux users fire up a task manager to see what programs are taking up how many threads and what percentage of CPU time. Most Windows users probably won't because their Windows version has no such program or if it does, doesn't provide enough information.

For years, TaskInfo2000 was the most thorough task manager

available for Windows. TaskInfo2003 ups the ante by streamlining the interface, providing keyboard shortcuts throughout the app, and adding many real-time graphs to the main program and a new System Tray icon. This is in addition to having the most thorough task list available.

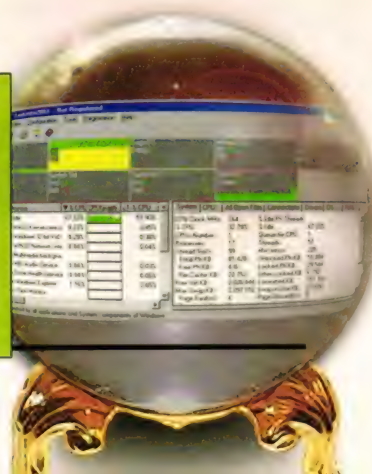
The task list shows an app's processID, name, CPU usage for the second, a running graph of CPU usage, overall CPU time, CPU switches, number of threads, memory

used and allocated, CPU priority, version number, 16-or 32-bit state, number of handles, number of Windows processes, the start time, the path to the executable location, and more. To kill a process, right-click the

choice and choose Kill Process from the menu.

This beta was a model of stability, looking and feeling like a polished product. ▲

Official product name: TaskInfo2003
Version # previewed: 5.0.0.73 beta
Publisher: Igor M. Arsenin
Developer and URL: Igor M. Arsenin; www.iarsn.com
ETA: Q4 2002
Why you should care: There's no better way to keep track of background tasks.



Drive Health 2.0.25 beta 3 & SIGuardian 1.61 beta

It's not often that nearly identical utilities are released to beta at the same time, but that's exactly what we have here: a pair of SMART hard-drive checkers that do the job nicely.

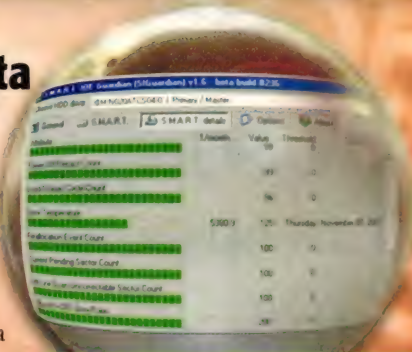
SMART (Self-Monitoring Analysis And Reporting Technology) is a technology that tracks how well a disk drive is working, measuring how long it takes to spin up from idle, how fast it retrieves data, how hot it is running, and more. The drive generates this information automatically, but you need software to read, display, and track the data over time. The software eventually builds a database of what is normal for the drive. If the software detects something abnormal (a threshold exceeded condition), it attempts to predict when drive failure will eventually occur. Though it may sound like snake oil, SMART-detectable failures account for 60% of all failures, according to some manufacturer reports.

Drive Health and SIGuardian do basically the same thing: read SMART information and

predict when a failure may occur. Both install easily, take very few system resources, and run about \$25 once the shareware trial period ends. Drive Health is the simpler of the two, taking only 0.09% of CPU time. It displays less information, however, in a very compact form. It does display a drive's temperature in the System Tray and has an excellent Help file.

SIGuardian is far more comprehensive and configurable, though it takes 0.2% of CPU time. It lists much more information about the drives—such as a UDMA mode and all the different temperature-sensor readings instead of an average—displays neater looking charts and graphs, and generates HTML reports. It can also send a drive into sleep mode if its temperature exceeds what's considered safe.

Though SMART isn't foolproof, these programs are worth the price if you want to take precautions against data loss. Both are stable and well mannered and get the job done. ▲



Official product name: Drive Health
Version # previewed: 2.0.25 beta 3
Publisher: Helexis Software Development
Developer and URL: Helexis Software Development; www.drivehealth.com
ETA: Q4 2002
Why you should care: The simplest way to get SMART drive information.

Official product name: SIGuardian
Version # previewed: 1.61 beta
Publisher: PalikSoft
Developer and URL: PalikSoft; www.siguardian.com
ETA: Q1 2003
Why you should care: The most thorough way to get SMART drive information.

MailWasher 2.0.13 Beta

What length will you go to avoid spam? If no length is too far, check out MailWasher 2.0, now in a nice and solid beta 13.

MailWasher speaks SMTP, POP3, and Hotmail (with more Web-mail types planned). The app logs into your mail accounts *before* your email program does, downloading a list of all your mail's headers, subject lines, and sender addresses. It then applies rules to estimate whether the mail is spam or any one of several well-known viruses. Mail displays in a list with checkboxes next to each item for deleting the mail from the server, blacklisting the sender, or bouncing the mail back to the sender.

The bounce feature has the potential to solve your spam problem, if used judiciously. When you bounce a message, it creates a mock "error; addressee unknown — not a valid email address" message and tries to send it back to the sender, either

directly to the SMTP server or if that fails, through your server or your ISP's. If the spam's author tracks bad email addresses and shares that list, you should see less spam over time. MailWasher can also learn your preferences and automatically tag spam and known viruses for removal and blocking. It can also do this based on email addresses or domains you've blacklisted.

MailWasher can automatically launch most email client programs, which retrieve the mail remaining on the server. The app can also automatically check your server for new mail every few minutes and alert you to spam.

It's hard to say how much time you save with MailWasher (you still need to sort through your mail and tag spam *before* you get your mail), but it's at least a proactive step to reduce spam while making life more difficult for spammers. The program is freeware, but it displays a large, distracting banner ad until you register this otherwise fine software. ▲

Official product name: MailWasher
Version # previewed: 2.0.13 beta
Publisher: Nick Bolton and eCOSM 2000
Developer and URL: Nick Bolton and eCOSM; www.mailwasher.net
ETA: Q4 2002
Why you should care: A proactive approach to killing spam and annoying spammers.

Send Us Your Betas

Know of software in the beta stage that's deserving of some attention? Let us know. We'll take a look at it and possibly give it a go-around. Send your prospects to bleedingedge@cpumag.com.

Manage Your Media

A Slew Of Players For Your Review

MP3, Ogg Vorbis, DivX, AVI. They're everywhere. On the Web. On your PC. Our computers are teeming with huge files with strange names that deliver to us the audio and video content we want. Of course, you need software to manage these media files.

We've rounded up a dozen applications for Windows, Mac OS, and Linux that can help you play, organize, and create digital media files. Try out a few and you'll be a media magnate in no time. To test our media players, we used a 700MHz PIII system with 640MB of RAM running WinXP. Our reviews are broken into two sections: Audio Players, for those apps that specialize in this area, and Audio & Video Players.

AUDIO PLAYERS

MusicMatch Jukebox 7.5

When we looked at MusicMatch Jukebox 7.0 for the March 2002 issue of *CPU*, it was barely tolerable. Version 7.5 is vastly improved. If you've tried it before and didn't like it, the program is worth another look.

The free, Basic version can play media, rip, and burn CDs, although ripping and burning is slow and throttled back a bit too much. The Plus version ups the ante with faster MP3 ripping and CD burning, an ability to print customized CD labels and covers, and additional features for organizing your music collection. The well-developed burning tool lets you create audio DVDs and multisession CDs and save and restore burning projects.

The program also serves up copious information about the media you're imbibing. For example, for MP3s and audio CDs you'll see a track listing, reviews, cover art, and album credits in the program's integrated Web browser.

If that's too much information, roll up the browser for a more svelte interface.



MusicMatch Jukebox 7.5

Basic, free; Plus, \$19.99

MusicMatch

www.musicmatch.com

Platform: Windows



Jukebox includes access to streaming Internet radio stations that are more customizable than most. You can create stations that play your favorite artists and get personalized music recommendations. The best features and content are reserved for subscribers to MusicMatch's Radio MX service, which costs an additional \$4.95 per month (less if you commit to a three- or 12-month subscription).

Sonique 1.96

As the name implies, Sonique is dedicated to audio. It plays MPEG, WAV, audio CDs, Windows Media Audio files, and SHOUTcast and Icecast streams. Sonique's support for OGG files is iffy; files created with more recent versions of the protocol didn't work.

The program is blessed with a fun interface, featuring colorful buttons and labels that flow around the window when clicked. Features include a graphics equalizer, ID3 tag editor, skinnable interface,

and plug-in support. The program doesn't directly support CD databases, such as CDDb and freedb, but a third-party plug-in adds support for them. Another plug-in adds support for video files.

Sonique includes a music search tool, but it's a disappointment. It simply sends your query to the Lycos and HotBot search engines, which typically lead to less-than-satisfying results. The program is free, but be prepared to endure a laborious registration process before downloading it. Version 2.0, now in alpha testing and without a firm release date, promises an improved user interface and customization options. If the search capability and support for Ogg Vorbis are improved, Version 2 could be a contender.



Sonique 1.96

Free

Sonique

sonique.lycos.com

Platform: Windows



Visual MP3 4.2

Although it has kind of a Windows 3.1-esque interface, Visual MP3 is a pleasant MP3 player and ripper that offers some unique features. It includes an unusual Karaoke mode that displays lyrics as a song plays; you can bind

lyrics to music files yourself or download ready-made lyric files. The app's playlists are also compatible with Winamp's, which is a nice touch.



Visual MP3 4.2

\$29.95 after 30-day trial
iProgram Development
www.iprogramdev.com
Platform: Windows



Visual MP3 offers good tools for organizing your music collection, including fast search and sort functions. The renaming tool will quickly give music files better file names based on their ID3 tags. Version 4.2 adds the ability to edit ID3 tags and query and submit data to the freedb database.

Do you feel compelled to brag about your killer MP3 collection on the Web? Then use the program's HTML List function, which exports your list of music as an HTML file, sorted by artist, title, or album.

If your digital music collection is limited to MP3s and OGG files, Visual MP3 is a competent player spiced up with thoughtful extras. We just wish the interface were a little less funky. Thankfully, registration includes free upgrades for life, so you won't have to pay again for a future version with a more polished look.

Winamp 3

Winamp is a free, fun media player that specializes in MP3s, CDs, and SHOUTcast streams. Version 3 adds support for video but is limited to a proprietary video format that isn't widely supported. So forget the video and stick with what Winamp does best: audio.

The program is available in Lite, Standard, and Full versions, which offer varying degrees of features and girth. (Only the Full version, weighing in at 3.2MB, was available at press time.) All versions include the basics: the ability to play MP3s, Ogg Vorbis, and SHOUTcast streams. (SHOUTcast, Nullsoft's free streaming audio system, is one of the most comprehensive directories of streaming radio stations.) The standard version adds visualizations, and the full version adds support for WMA files, too.



Winamp 3

Free
Nullsoft
www.winamp.com
Platform: Windows; Mac OS Classic
alpha version



Winamp's interface is sleek and efficient. It doesn't waste screen real estate; it compresses a graphic equalizer, playlist editor, media library, mini Web browser, and visualizations into a surprisingly small space. The app also makes it easy to hide any features you don't need. The program supports skins (of which a ton are available for download), or you can just stuff it in the System Tray for a no-interface interface.

If you just want a reliable, cheap program for listening to digital music with crossfading and other sound controls without a lot of other baggage, Winamp is a great choice.

AUDIO & VIDEO PLAYERS

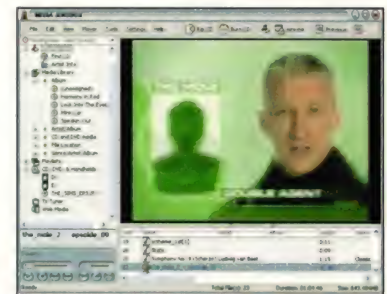
Media JukeBox 8.0

If there's only room in your life (or your hard drive) for one media player, Media JukeBox just might be the one. It can play virtually every type of audio

and video media, including RealMedia, QuickTime, Audible, Windows Media, Liquid Audio, DVDs, and even video from a TV tuner card. In addition to playing, it can rip audio CDs; encode in MP3, OGG, WMA, and other formats; and burn your media creations to disc.

Version 8 adds support for plug-ins and for online CD and DVD databases. The Plus version adds a media library; faster CD burning (the free version is limited to painfully slow 2X); an editor for trimming, splitting, and modifying sound files; and the ability to print CD labels and jewel case inserts. The DSP Studio feature provides a 10-band equalizer, environmental effects, and simulated surround sound.

A cool Media Scheduler lets you automate virtually any function, from setting an alarm to playing an MP3 at quitting time to recording your favorite show with your TV tuner card. The standard interface works well, but you can opt for something a little more flashy with a skinnable mini mode.



Media JukeBox 8.0

Basic, free; Plus, \$24.98
J. River
www.musicex.com/mediajukebox
Platform: Windows



Media Wizard 7.1

Media Wizard is a capable little audio player, encoder, and editor that works with MP3, WMA, Ogg Vorbis, audio CDs, and many other common file formats. Although the program is supposed to handle AVI and MPEG video, too, it hung when I tried to watch video files, so stick with audio.

The application includes plenty of editing and audio-conversion tools. You can convert media between MP3, OGG, WMA, WAV, and audio CD formats. Then you can use the editor to crop, fade, append, and add audio effects, such as echo. The editor can also import audio from a microphone or line-in sources, so you can convert your old Tom Jones LPs to digital format.



Media Wizard 7.1

\$50 after 15-day trial

CDH Productions

www.cdnow.com

Platform: Windows



All in all, Media Wizard is a good player for audio with CDDb support, an MP3 tag editor, good playlist management, and other niceties. But the \$50 price tag seems a bit too high given the fact that we couldn't get it to show videos.

MoviX 0.6.0

Here's a unique angle on the player scene: MoviX is a media player that's actually a small Linux distribution. Install it on a CD-R along with your media files, and it contains all the software necessary to boot from the CD and play your media. It's a cool way to create a portable video show that will play on practically any PC, regardless of what software or operating system is installed. MoviX supports DivX, AVI, MPEG, MP3, Ogg Vorbis, and other formats.

To create a MoviX disc, you need a CD-R burner and burning software. Open the MoviX ISO file in your burner software, then add the video and audio files to the disc's root directory.

Burn the disc. Now boot any PC with that disc for an instant movie on the go.



MoviX 0.6.0

Free

Roberto De Leo

movix.sourceforge.net

Platform: Linux



An offshoot of the project, MoviX2, has a different philosophy: It's a stand-alone player that lets you switch discs after booting, so you can play any DVD, VCD, or audio CD without special preparation.

QuickTime Player 6

For Mac users, QuickTime is practically a necessity, which is fine because it comes preinstalled with Mac OS. For Windows users, it's a useful player to have around to view all sorts of media.



QuickTime Player 6

Basic, free; Pro, \$29.99

Apple

www.apple.com/quicktime

Platform: Windows, Mac OS



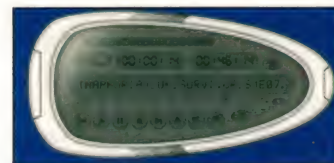
The free QuickTime Player can choke down a massive variety of video and audio file formats, from MP3s to 360-degree-view virtual reality images. The newest version's claim to fame is that it supports MPEG-4, a standard for delivering high-quality video and

audio streams. If QuickTime doesn't support a given format, chances are good that you can add support with the help of a plug-in. For instance, you can add MPEG-2 support with the \$19.99 MPEG-2 Playback Component.

The \$29.99 Pro version adds the ability to play movies in full-screen mode, download and save movies from Web sites, and import and export media in a variety of formats. It also offers basic authoring tools, including the ability to create MPEG-4 content, edit movies, and build video slideshows. It's not a replacement for a full-featured video-editing suite, but it's good enough for editing home movies or converting peer-to-peer movie downloads to CD-V format.

RadLight Special Edition 3.03

RadLight is a video player that's supposed to handle DivX, AVI, RealMedia, and other formats. The program is a monstrosity. First, it wouldn't play some of the perfectly valid files we tried it with. Later, it refused to open any files at all. An unstoppable flood of error messages in German followed this, then a system crash. As a bonus, the app installs adware on your PC.



RadLight Special Edition 3.03

Free; \$20 to remove ads

RadLight

www.radlight.net



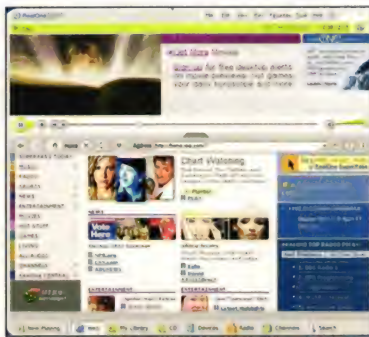
RealOne Player

RealOne Player supports more than 50 media types, but its specialty is streaming audio and video codecs. The Basic player is a free, capable program that plays many media types, rips MP3s, and burns CDs. For full functionality, upgrade to the \$29.95 Plus version or subscribe to SuperPass, a \$9.95 per month service that includes the plus features and access to an

impressive library of premium streaming media content.

The Plus version adds the ability to play Windows Media and QuickTime MPEG-4 media, do variable bit-rate MP3 encoding, use a 10-band graphic equalizer, crossfade between audio tracks, record from analog sources, print jewel case inserts, and more. The free version isn't so crippled as to be unusable. With it, you can do high-quality MP3 encoding and full-speed CD burning and have access to thousands of online radio stations.

Version 2 of RealOne Player overcomes many of the problems that stymied the first version. It's faster and less expensive, but the multiple-pane interface with an integrated Web browser can be cluttered. Good thing there's a nice full-screen theater mode.



RealOne Player

Basic, free; Plus, \$29.95

Real

www.real.com

Platform: Windows, Mac OS X



Threefifteen Jukebox 2.42

Threefifteen Jukebox is an unremarkable player and ripper that supports MP3, Windows media, audio CDs, and a few other common audio formats, but not Ogg Vorbis. The program, built on a Microsoft Access database, is meant to manage a large digital audio library. The makers claim it can handle more than 20,000 files.

Threefifteen's interface, which resembles a vintage jukebox, is either quaint or

gaudy. (After all, beauty is in the eye of the beholder.) Whether or not you appreciate the look of the jukebox, the program's interface is its biggest liability.



Threefifteen Jukebox 2.42

\$29.95 after 15-day trial

Open G

www.openg.com

Platform: Windows



The interface is clumsy and just nonintuitive enough to make you crazy. For instance, you have to press the Record button to simply listen to a CD or look at its tracks. Worse, the program inexplicably couldn't play any of the CDs I inserted (indicating they might be dirty or scratched, although the same discs worked fine with other programs) and finally spewed an endless loop of error windows. At least the Wurlitzer at the local coffee shop doesn't do that.

Windows Media Player 9

The newest version of Windows Media Player, in final beta testing when I tried it, is a worthy tool that supports just about any media format you can throw at it, including Video CD.

At first glance, Windows Media Player 9 looks a lot like Version 8, which shipped with WinXP. Behind the scenes, the new version adds several codecs, many of which aren't yet available in other media players. There are protocols for better-compressed and higher-quality video and audio streams, a new codec that supports 5.1-channel surround sound, and a lossless, compressed audio format aimed at audiophiles.

There are also interface improvements in the program. A mini-player mode moves controls to the Taskbar for less clutter. The Info Center serves up details about the CD, MP3, DVD, or stream you're taking in, including artist bios, lyrics, discographies, and album covers. Other new features include variable speed playback, which can speed up audio without making it sound like it was recorded by Alvin and the Chipmunks.

The excellent Windows version is light-years ahead of the Mac versions. The version for Mac OS Classic is a crash-prone atrocity, and the OS X version hasn't been updated to include version 9's new features.



Windows Media Player 9

Free

Microsoft

www.microsoft.com/windows

/windowsmedia

Platform: Windows,

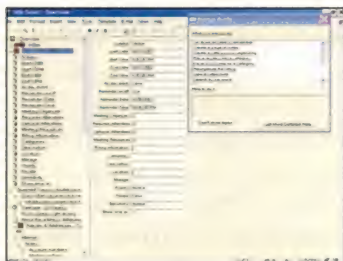
Mac OS Classic and X, Solaris



Manage Your Media

For good, old-fashioned enjoyment of MP3s and Ogg Vorbis tunes, my pick is Winamp. If you want to rip and burn music, too, take RealOne Player and Media Jukebox for test-drives to see which you prefer. For video, stock your arsenal with either QuickTime Player 6 or Windows Media Player 9. You should now be ready to handle the teeming masses of digital media files that await you. ▲

by Kevin Savetz



Info Select 6

\$149.95 (free 30-day trial)

Micro Logic

www.miclog.com/is/6/info.shtml



Micro Logic Info Select 6

Info Select 6 is deservedly one of the last great surviving PIMs. This once-popular software genre stores and reorganizes every flavor of personal data, including email, calendars, notes, letters, Web links, and projects. If you can master/embrace a PIM, it often becomes the core of your desktop.

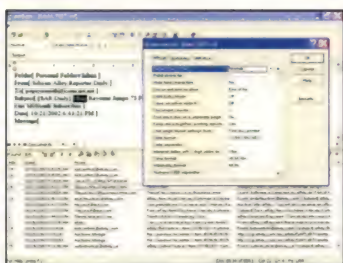
All PIMs I've seen have a mountainous learning curve. Info Select is a bit better than most, greeting you with a Startup Guide and offering tutorials for most common tasks, including making notes, to-do lists, and calendars. The app has templates for phone messages, fax cover sheets, and purchase orders.

The app's familiar outline format puts topics in a Selector area to the left and data in the Workspace to the right. Data can be fully free-form text, email messages, attached files, structured database data, or Web links. Info Select keeps them in a single spot you can search, retrieve, reorder, and print in various formats.

You can also search Web cache, and the app can use neural search routines to look for approximate matches off multiple keywords.

Tasks are easier said than done. I'm still figuring out how to import my Outlook calendar. Info Select pulled in my Outlook address book but hung when importing messages. The Selector window also gets cluttered and complicated quickly when simply dumping information pieces into the program. The outline format seems best suited for organizing large amounts of research or stray notes. My favorite feature is the Transport tool, which lets you highlight data in most other programs and import it directly into Info Select.

Info Select is an acquired taste. Hard documentation and concrete examples of the PIM at work would help. With patience, though, it could become indispensable. (Info Select 7 was released around press time, adding more than 100 new features and improvements.) ▲



askSam 5.0

\$149.95 (free 3-day trial)

askSam Systems

www.asksam.com



askSam Systems askSam 5.0

AskSam is the granddaddy of PIMs, although it's more a free-form and text-based database than a PIM. This version demonstrates how wisdom and polish come with age. Where Info Select is a good everyday tool, askSam seems better at handling massive projects involving maintaining, searching, and printing from large databases containing everything from email archives to images.

With askSam, you search for specific data and get a list of results you can view in multiple ways or massage into a printed report. One cool feature is Hypertext Links, which puts active links in databases or reports that pull up other files or just another spot in the same document. This turns reports into highly interactive documentation or vast menus and indexes that users can point and click into a deeper trove of information.

You can theoretically enter data in free-form style and let the powerful search engine find what you need later, but askSam works best when you make basic database fields to organize the data up front as a series of records.

askSam has more than a dozen templates for storing or importing all types of files for storage, searching, and reporting, including email, clippings, Web site notes, Internet research phone directories, etc., each with detailed instructions for use. Within seconds of starting askSam and not having read a word of the excellent print documentation, I was importing and searching out email. The app knows the major email formats, so it found my Outlook inbox and offered to import messages across a date range, from specific folders, and with/without attachments. I was then able to create a sorted report of all incoming messages with Sender and Subject lines.

With its full-featured word processor, you can use askSam to compose and keep your correspondence, documents, faxes, and memos within an engine that essentially makes your work a single searchable database. askSam is the go-to information manager for sifting through massive piles of information and publishing them for easy use by others. ▲

Sandra Professional 2002 SP1

If you read *CPU*, there's a good chance you at least have the freeware version of SiSoftware's Sandra. This diagnostic and system analysis tool is like crack for hardware freaks. It's so geeky, its actual name is short for System Analyser, Diagnostic, and Reporting Assistant. Now that's tape-on-the-eyeglasses, pocket-protector geeky.

First and foremost, Sandra goes through your PC like Orcs hunting down Frodo. The Pro version of Sandra contains 80 modules that scan, probe, and report on every conceivable aspect of your PC, from identifying the CPU, audio, video, and I/O subsystems to benchmarks for most of the major elements in your configuration. The free standard version has 58 modules, while the advanced version has 68 and requires registration with SiSoftware.

This vast collection of discrete modules takes the form of a sea of labeled icons in Sandra's opening screen. It looks more impressive than it really is or needs to. Many icons are trivial. Do we really need discrete programs to read the Win.ini, System.ini, and Autoexec.bat files, respectively? Windows has no trouble merging these functions into the Msconfig.exe program. Regardless, once you decide on your favorite diagnostic modules in the package, you'll find they're a joy to use and reuse.

For the uninitiated, Sandra's analyses can be monstrously detailed. In probing for software modules loaded into your Windows OS, one utility not only registers each of the DLLs and EXEs currently running (natch) but also tells you where its file is on your system, whether it shares data with other files, and even the number of processes it has running in the background. Deep enough? Even the Font Information utility lets you scroll through every installed typeface on your system and see its "average cell letter width" or its "weight." We didn't even know that fonts *weighed* anything until we discovered in Sandra's superb help file system that this refers to the degree of bolding.

Indeed, for quasi-geeks, Sandra is an education in itself. Each module has a detailed help file that explains most (alas, not all) of the relevant terms and even includes a massive index of computer acronyms.

My PC Is Not That Slow

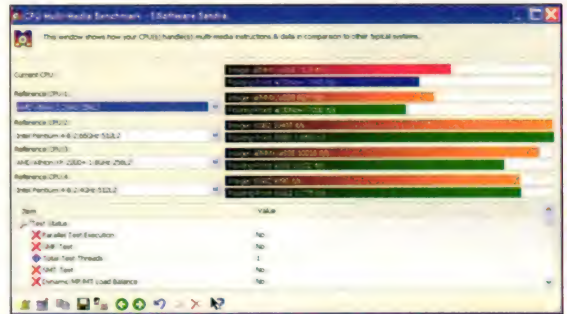
Most PC hounds will give the app's seven benchmark modules frequent workouts because Sandra compares current system performance with better and lesser CPUs, memory, or hard drive subsystems. The current SP1 version of Sandra 2002 (which Sandra 2003 may have replaced by the time you read this) contains stats for 2.6GHz Pentium 4s, so these benchmarks are bound to humble most of us for a while, at least.

The benchmarks are synthetic, so they leave a lot of room for argument about how they reflect real world performance. Still, these routines are just too cool. For instance, the Cache and Memory Benchmark utility tests the CPU cache with packets from 2KB to 64MB, compares the results with four other processor/chipset combos of your choosing, and then graphs all of them into a line chart to show how performance changes with bigger data chunks. Yeah, baby!

To be sure, however, Sandra does have real functionality. The Burn-in Wizard runs all of the major tests continuously to break in all aspects of a system and reveal any weaknesses. The Tips function in most modules appends recommendations to the read outs for tweaking your system's performance, although many of these tips are banal and obvious. And a Report Wizard lets you run any set of tests and create a full report in a number of compatible database and HTML formats. Anyone managing an office of PCs might want to pack this disc right alongside her pager as a quick way to diagnose PC problems.

For the rest of us, having all of this diagnostic and benchmark information about our own PCs can only lead to one thing: coveting that more expensive, powerful PC that we don't own. Of course, for the PC obsessive, Sandra is like handing a medical encyclopedia and MRI machine to a hypochondriac. This program could keep you tweaking and checking every subsystem until the guys in the white coats come to talk you out of your den. ▲

by Steve Smith



Sandra Professional 2002 SP1

\$29, single-user license

SiSoftware

www.sisoftware.co.uk



Veni Vidi Video

After buying a digital video camera worth more than my car, I had to find software that would unleash its power. Face it, just because you can press Record doesn't make you George Lucas. You also have to write weak plot-lines, find substandard actors to assume the characters, and use boy bands to ward off the galaxy's minions of evil. Once you've "forced" these things under control, you should also take a class on home filmmaking. Your shots should be steady, the close-ups should be calculated, and for Luke's sake, keep scenes to 10 seconds or less. If there's one thing I've learned from hosting my own television show, it's take more footage than you'll ever possibly need—but don't use all you take. Edit, you must.

iDid run iMovie through the iWringer, but iDon't think it works as nicely as it should. To put it another way: Don't swallow the age-old tale of Macintosh machines being more user friendly for multimedia applications. It all depends on the software you run (independent of the platform).

Once you have the elements lined up (including a soundtrack), creating a decent video should take no time at all. "Jeez, it's challenging enough to dump the footage onto my hard drive, now you're telling me I have to watch it, parse it, and get it synced with the music?" You could do that, or you could let muvee autoProducer (\$50; muv.ee.com) do it for you in Windows. autoProducer is going to revolutionize how people work with digital media. If you don't believe me, download and try it for yourself. You'll be blown away by its genius—guaranteed. What does it do? Everything. Literally. It's better than anything Apple's developed for this particular market, that's for sure.

You feed autoProducer random (or sequential) video clips and some digital music. It analyzes the data and after you select a "theme," automatically compiles the movie for you. I kid you not. Transitions, titles, styles—all done on the fly in a WYSIWYG environment. If this utility doesn't have you dropping your jaw, you've never spent entire days perfecting just five minutes of video. Oh, and the best part is that you can export it in

MPEG, AVI, or directly back to your DV camera. It's the ultimate solution for anybody who wants to arrange a product he won't be afraid to show his friends, for anybody who only wants to spend an hour (max) on one particular video project, or for anybody who wants the computer to start working for him or her.

I'm sure you control freaks have already started to freak out. You want to control every microsecond of your production, and there is nothing wrong with that. For you, I recommend some-

thing better than the seriously pathetic Windows Movie Maker. What was Microsoft thinking? Notepad is more useful. Anyway, please turn your attention to Pinnacle Studio 8.1 (\$99; www.pinnacle.com). I wish I had checked it out before I leapt into Sonic Foundry's Vegas Video, which wasn't

really designed with v1d3o n00bz in mind. Sonic has a very complete package in VV, and I have no doubt that my skills will be mad enough one day to use it. Does that mean I'm already planning my switch from Studio? Nope.

After clicking through a convoluted installer, I was face-to-face with a nonstandard (yet very elegant) UI. Are you listening, Lotus? I didn't have to search through endless menus to complete rudimentary tasks; without touching the manual I started building a new movie in less than a minute. As any good video editor should do, Pinnacle Studio 8.1 imported a saved MPEG and automatically split its scenes with ease. Creating a transition is as easy as dragging and dropping it between sorted clips in your timeline. I was truly surprised at how well it worked. Steve Gibson (the world's hero from GRC.COM) recommended it, and Jason Dunn (my buddy from pocketpc-thoughts.com) reinforced that recommendation.

Just do me one favor, eh? If you take your camcorder wherever you go, don't make me sit through hours of useless footage. Give me a "best of." I'll thank you for it, and so will your loved ones. ■

You can dialogue with Chris at chris@cpumag.com.

**If this utility doesn't
have you dropping
your jaw, you've never
spent entire days
perfecting just five
minutes of video.**

In his spare time, Chris enjoys playing with his ferret, which is kinda weird because he doesn't own a ferret. It's more like a dog, although the dog sometimes acts like a ferret. Chris is seeking counseling, and as part of his ongoing therapy, he is required to write a monthly column for this magazine. Which is great for us, because we love the stuff he writes. C'mon, just read it and tell us you're not impressed. Who else would be so bold as to write about George Lucas' shortcomings? Now he'll never get propositioned to play the role of Clonetrooper #27 in the last of the prequels, "Star Wars: Insert Sucky Title Here."

Wishful Thinking & Free Computing



Pete Loshin is a former technical editor of software reviews for BYTE Magazine (print version). Pete is also the author of "TCP/IP Clearly Explained" (4th edition available everywhere real soon now) and covers network protocols, security, and open-source software.

1 86,000 miles per second isn't just a good idea, it's the law. What follows are examples of open-source software that can trump law.

First, Microsoft's WinXP license forbids use of non-Microsoft software to remotely access an XP desktop. You must buy another license, with all that entails, to access the desktop from another PC.

Or, you could use Virtual Network Computing (www.uk.research.att.com/vnc) to run a server on your primary PC and a viewer client to access your main desktop remotely. The client software fits on a bootable floppy, making VNC easier than Windows by a factor of "a lot," and it works to and from almost any OS.

You could, as an individual, ignore the clause and hope Microsoft never finds out. You could buy the licenses, or you could stop using Windows. Organizations, subject to Microsoft audits, ignore the clause at their peril. If Microsoft decides the issue is costing it money, don't be surprised if it starts auditing individuals.

Next, the Panamanian government decreed this October that ISPs start blocking traffic on UDP ports used for VoIP (Voice over IP). VoIP lets you make toll calls over the Internet for next to nothing, threatening POTS (Plain Old Telephone Service) providers who charge more. Kind of like Disney lobbying Congress to change copyright laws so Mickey stays out of the public domain (yes, it's happened). Panama's move won't work. Eventually, it will have to block *all* UDP ports, as VoIP works over any UDP port; that'll break DNS and strand Panama with no Internet access.

Open source to the rescue: Vovida.org (www.vovida.org) sponsors VOCAL (Vovida Open Communication Application Library), a toolbox for building new VoIP apps and services. VOCAL lets you build telephony gateways to route calls and optimize for cost/quality, secure phone links, offer special services, even start your own VoIP business with VOCAL's billing features.

Finally, can law stop spam? It hasn't yet. U.S. anti-spam laws are helpless against spammers abroad; court-based anti-spam methods—from

suing spammers for denial of service to anti-spam laws and spam fines—are circumvented almost as easily as spam filters.

Habeas (www.habeas.com) offers a non-free solution: It will insert copyrighted haiku into a patent-pending mail header to certify it "spam-free." Use the header without authorization or copy haiku without permission and Habeas will sue your pants off. Clever, but Habeas only works if everyone buys in; individuals get the service for free (for now), but organizations must pay.

A better free approach works now using Naive Bayesian sorting (see www.paulgraham.com/spam.html). Traditional spam filtering is labor-intensive. For example, almost any message with "money" in the Subject header is spam, but spammers beat filters with alternate spellings and new pitches, so users must constantly create new rules.

POPFile (<http://popfile.sourceforge.net>) sorts mail into "buckets" (personal, work, spam). You "train" the app by scanning messages you've sorted into those buckets. POPFile looks for unique words and classifies them as more or less likely to be associated with each bucket. Most messages I get with HTML tags are spam; ditto for "offer," "HGH," and "Nigeria." POPFile adapts with the contents of the buckets, especially as false negatives move into the spam bucket. Researchers report that this approach can achieve better-than-human accuracy in as little as three days.

The beauty of this approach is that it keeps working, automatically, even as spammers change their messages. "m0ney" or "munny" may fool POPFile once each, but there are only so many ways to misspell a word. The only way to consistently get through is to send nonspam messages.

Laws that can't be enforced can lead to more restriction on our freedoms. We can either cede our rights to the government, software companies, and spammers, or demand the right to protect our rights with free and open software. ■

**Finally, can
law stop spam?
It hasn't yet.**

Get saucy with Pete at opensauce@cpumag.com.

Words From The Web

YEAH, THEY *ACTUALLY* SAID THIS . . .

From an MSN 20s chat room:

BBBBBBBBBBUUUUUUURRRRRRRRRPPPPPPPPPP

I could smell that all the way across the Internet

From a Yahoo!

Computers chat room:

**When did my
idiocy come into
question??**

No questions here.



From a starwars.com mes-

sage board regarding the first thing Anakin Skywalker will say when he becomes Darth Vader:

**"I can't see a thing
in this helmet!!"**

The farce is strong in this one.

From the *Computer
Power User* forums:

**Human nature
states we
never, ever
proofread
before hitting
the Submit
button.**

What's proofreading?

GOOGLISM

Ah, the fun we have with Google.com. It never ends! Some clever folks from down under have created a way for Google.com to give you its opinion on just about every subject you can think of. Go to www.googleism.com; enter a person, place, or thing; and see what Google has to say about it.

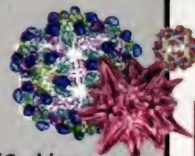
There are four categories of googlisms: Who, What, When, and Where. Type a word or phrase in the search box, select your category, and click the Googlism! button. The site will tap into Google's resources and find phrases in Web pages that are relevant to your search term. If you simply want to waste some time, check out the top 30 googlisms in each category by clicking the Who, What, When, or Where Googlism links on the site's home page.

I did a bit of googlism ego surfing and found out that Google doesn't think about me at all, but thinks that Michael Sweet, the former lead singer of Christian rock band Stryper, is much better than Axl Rose (uh huh, whatever). I also searched for Computer Power User, and Google apparently thinks that CPU is for "people who know that technology rocks." Rock on, dude!

Infinite Loop Name Calling

Virus names are usually a lot funnier than their contents, just as some childhood nicknames are often more entertaining than the celebrities they belong to. See if you can guess which of the following are movie stars' nicknames and which are viruses.

- | | |
|-------------|-------------------|
| 1) Death | 6) Nabber |
| 2) Skeletor | 7) FishLips |
| 3) TheWall | 8) Canine |
| 4) Slapper | 9) Ethan |
| 5) Flop | 10) WhoopiCushion |



ANSWERS: Celebrity nicknames: 2 (Cameron Diaz), 3 (Keanu Reeves), 7 (Denise Richards), 8 (Celine Dion), 10 (Whoopi Goldberg). And yes, Ethan is both a virus and a celebrity name.

SOURCES: IMDB.COM, KASPERSKY LABS

by Michael Sweet

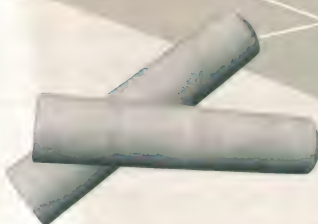
It All Started When . . .

You wanna be a warchalker? Stop by the warchalking.org Web site, which posts messages from fellow chalkers, as well as warchalk-related news and some information about warchalked locations. It's a cool community for wireless hobos. You'll also want to check out www.blackbeltjones.com/warchalking/index2.html. Here you can learn more about warchalking from Matt Jones, a freelance design consultant based in London who is credited with creating the idea of warchalking.

Create-A-Chalk

Confused about how to chalk up an open access node with 1.5Mbps bandwidth that's 10 meters to the right? Go to this site, enter the relevant data, and it'll spit out a PDF of what the warchalk symbol should look like. No need to think for yourself.

cheerleader.yoz.com/warchalk.html



WARCHALKING, Old School

Warchalking is inspired by the hobo practice of marking locations with hieroglyphs to inform other hobos whether people in the area were friendly or inclined to pummel hobos on sight. Check out these sites for hobo signs:

www.worldpath.net/~minstrel/hobosign.htm

www.slackaction.com/signroll.htm

JOHNCHALKING

www.cape-mac.org/mac/wcdelight/johnchalk.gif

THESE CHALKS WILL STEER YOU TOWARD FLUSHING MEADOWS AND AWAY FROM THREE MILE ISLAND.

YUCK!



UNSANITARY CONDITIONS

SINGLECHALKING

I'm sure it's only a matter of time before savvy wireless users start chalking themselves and each other. This will be especially useful in bars, dance clubs, and New Year's Eve parties when singlechalkers are trying to decide who's "in play" and who they should stay away from. With that in mind, we've created a few singleschalks for your consideration. Wear them to attract your ideal mate or to shoo the geeks away.

name
 = single, looking
 age

= single, not looking

= married, no chance





ATOMSHOCKWAVE

Short-Format Video Is Poised For The Big Time

Once upon a time, long ago in the mid-1980s, MTV played music videos. Good ones. Videos that contained stories and imagination and weren't exercises in lascivious lighting or strobe-like jump cuts. Think Styx's "Mr. Roboto" or Michael Jackson's "Thriller."

Mika Salmi, now 36, remembers those times fondly. MTV drilled into his impressionable head that short-format videos could be engaging and wildly popular. By the end of the '80s, Salmi had taken up work in the music industry

together for Salmi. Suddenly, the idea of a short-format programming channel made sense, only now broadcast over the Internet instead of cable.

Salmi was able to peer over the shoulders of the market researchers at RealNetworks, and he learned that there were three factors driving what people would watch online. Content had to be unique, short, and only available through one point. The more Salmi learned and thought, the more he was convinced that the time was right to make his vision a reality.

visit to sample the content. What Salmi and his executives had failed to anticipate was that the site was destined to become a blockbuster hit with millions of 'Netizens.

Making It Big, Getting Little

Once AtomFilms realized that it was developing a large public following, it worked to endear itself with the geek masses even further. In April 1999, AtomFilms launched a contest called "Makin' Wookie," the first of many "Star Wars" tie-ins that would make Atom the de facto hub



doing everything from marketing to signing bands such as Nine Inch Nails and Presidents of the United States of America. Around this time was when the personal camcorder craze started to hit in earnest, and Salmi recognized that there would soon be a lot of people creating a lot of movies, some of which might even be enjoyable to a large audience.

By 1993, Salmi was entrenched at Sony Music, and short-form videos continued to play on his mind. The following year, he put together a business plan for a short-form cable TV channel, but there was one problem: Salmi had no idea how to start a business, much less a cable TV channel.

Getting Real

In late 1995, Salmi jumped to RealNetworks. His primary job was business development, which meant working with record labels and radio stations to help propagate the RealAudio format. When the company introduced RealVideo in 1997, though, the pieces all started clicking

In the summer of 1998, the online business community was delirious on its own self-perceived potential. The wisdom of the day said that if you build a site, the advertisers will come, and trading profit for market share was the way to long-term riches. Salmi disagreed. He felt from day one that a profitable business model mattered most, so he launched AtomFilms that season with a plan that ran contrary to what most other companies were doing on the Web.

The company site, www.atomfilms.com, wasn't designed for the public. On-site advertising was an afterthought at best. The plan was to acquire the rights to short animations and films, then license the content to as many people as possible. And license it did. AtomFilms' early customers and distributors ran from HBO to Warner Brothers, Continental Airlines to SonicNet, and Go Networks to the Sundance Channel. Occasionally, odd clients would come along, such as one company that installed video screens in elevators. The Web site was merely a place such customers could

for LucasFilm parodies. Aardman's crackling good Wallace & Gromit animations became a major hit with viewers. The company continued to gain in popularity and soon completed two rounds of financing. In May 1999, Atom owned more than 100 short film and animation titles. By the following February, the collection had ballooned to more than 800.

Having gained a solid footing on the Web, Salmi then turned to the next question: Where else could these short clips play? Not music. Salmi knew from experience that the only way to secure full rights to music content was to become a music label, and that was one direction in which he had zero interest. Instead, mobile devices seemed like an obvious answer, and in April 2000, AtomFilms became a launch partner with Microsoft for the Pocket PC, making a large chunk of AtomFilms' catalog available for download to the PDA. In Europe, AtomFilms struck a deal with Nokia to license Flash animations for playback on users' smart phones.

Even though mobile devices might seem like the perfect medium for short format content, Salmi found that, by and large, there was no money to be made in the portable space. In the move from a 17-inch to a 4-inch screen, usage patterns altered dramatically. Even with converged PDA phones ready for America, Atom continues only to keep an eye on handsets, waiting for a better time to animate people's pockets.

In December 2000, AtomFilms announced it would merge with Macromedia spin-off Shockwave.com. Although there was a little content overlap between the companies, which together boasted more than 30 million registered users, Atom was predominantly about films and animation, while Shockwave.com distributed games, greetings, and applications. The two groups were seen as being complementary, and

combining them would yield a stronger company more able to sustain profitability.

When the merger was announced, analysts expected that about 100 people would be laid off. When the deal closed on Jan. 15, 2001, approximately 170 out of 180 were sacked. Only 30 positions were left open to which employees could reapply.

The press picked up the story as another dot-com roadkill in the making. What



UP CLOSE WITH MIKA SALMI

We spoke with Mika Salmi, CEO of AtomShockwave about target viewers, choosing content, and his thoughts on the future.

CPU: Do you ever run into trouble deciding which clips to accept?

Salmi: At the very beginning, we had Joe Cartoon's frog in a blender. Internally, we had a big controversy over that. I mean, we had Academy Award winners and all this famous, great stuff, and then there was this crass animation. How do you fit that together? I always thought that frog in a blender was very well done. [laughs] And I said, hey, our site isn't only going to be about this. We want to make sure that someone who may love Joe Cartoon could also get lured into watching a famous short film. Hopefully, we can expand people's tastes a bit, and if not, there's still choice.

CPU: When you first conceived of doing a short-format TV channel, what did you want to accomplish with it?

Salmi: I wanted to pick up where MTV had left off. I was very frustrated that MTV had

left off doing much with music videos. I wanted a channel where you could tune in at any time and get something interesting and good. When I was in France about 10 years ago, I used to turn on this channel called M2 that had short films and videos. I loved it. It would be on in the background, and I could just look up and think, whoa, that's cool. And after I got home, I really missed it. Now, a lot of people have the computer and multitasking is becoming the norm, especially with laptops. So I think our format will really fit with that.

CPU: We can gauge from Atom's site what the channel's content will be like, but who is the target viewer?

Salmi: It'll have a style and attitude that speaks to the 18 to 30 audience. Your likes encompass film, music, animation, and sports, but you're also too hyperactive and don't have enough time, so we're going to give it to you really fast. You could call it ADD TV.

CPU: How can you be confident that AtomTelevision will fly, particularly in today's economy?

Salmi: Our Web site has been up for four years and has delivered over 5 million pieces of content. And keep in mind that people watch this content under less than ideal conditions. Though the streaming is getting better with broadband, it's still not a great experience sitting at your desk. So the fact that we have a loyal audience already bodes well for people watching in the living room. Also, because we need to expand the content to accommodate a channel, I think in many ways it will be even more interesting than the Web site. Plus we can package it up and present it in a way that will be more compelling. Right now, everything is on-demand. I think a lot of mainstream consumers would rather sit back and have you feed them something.

CPU: But running a TV channel has got to cost some serious green, and AtomShockwave isn't exactly Warner Brothers.

Salmi: The digital tier is much lower-cost. Oxygen was

launched and went into like 20 or 40 million homes. They needed a lot of people watching in order to make money because they built this structure where they were producing content with a huge staff. We are using a lot of content we've already acquired. Our marketing is very low because we already have a robust Web site to use. So we have a much lower-cost basis for the overall channel. Obviously, we want to be as successful as possible, but we don't need to be a monster. It just needs to be moderately successful for us to do pretty well with it.

CPU: Look into the future and tell us where Atom is headed.

Salmi: Down the road, there is going to be convergence—that nasty word no one wants to say anymore. Digital cable is getting pretty close to it. Your AT&T box might not have it yet, but just stick a hard drive in. You'll be able to play games on it pretty soon. I want us to have a foothold in that world. The Internet is all about on-demand and interactive, but I think that experience is going to change a bit as the TV comes into things more. I want to be a part of that. ▲

wasn't publicized was that the executive staff, including Mika Salmi as AtomShockwave's CEO, stayed largely intact. AtomFilms thrived by purchasing ready-made short-format products. Shockwave.com, on the other hand, sported a ponderous staff that created its own content. The game development department alone employed nearly 60 people. AtomShockwave essentially exploded itself so that it could be re-created as a startup focused solely on purchasing and licensing content.

Return To The Tube

The plan worked. AtomShockwave picked up a large deal with Showtime, then started charging for some of its premier gaming content. In June 2002, Shockwave.com unveiled PhotoJam 3 Pro, a consumer-friendly application for

the resources to add many more, AtomShockwave is finally jumping into the living room.

Last fall marked the first foray for AtomTelevision. The company teamed with Comcast, now merged with AT&T Broadband, to provide a service called Atom on Demand. This is a selection of five one-hour segments available via Comcast's VOD (video-on-demand) service. Each hour is a sort of "best of Atom" collection spotlighting different types of content. For example, one collection is Academy Award-winning short films and animations while another, "Big Stars, Short Films," features big name stars such as Ewan McGregor, Matthew McConaughey, and Helena Bonham Carter.

Atom on Demand is almost a teaser for AtomTelevision's true rollout. Beginning

videos designed for entertainment but that showcase a certain product. Hey, if it's fun and cuts down on regular commercials, we say go for it. At least the production quality will be top-notch—unlike a lot of the well-meaning but amateurish videos stocking Atom's online catalog.

And whither will Atom wander tomorrow? A successful cable launch might indicate that the company's next move would be into longer format content, but Salmi says no. His company's niche is in the short form and will stay that way, although apps such as PhotoJam show increasing promise. The rollout of 3G networks may see Atom content streaming to more handsets, but don't hold your breath for watching Wallace & Gromit on your flip phone soon.

Atom's present endeavors ought to be enough to see it through the next



blending digital photo albums with edited and sequenced music tracks. With an increasingly diverse product base, AtomShockwave soon began seeing profitable months every now and then, but the revenue model had journeyed a long way from its roots. Today, only 20% of Atom's money comes from content syndication. Thirty percent comes from software sales and a full half of the revenue from advertising—and that's in the present ad-spending slump.

So with a fairly stable business and plenty of money in the bank, AtomShockwave needed a new frontier to conquer, and what better frontier than the medium that had inspired Salmi in the first place? Last August, AtomShockwave announced a joint venture with Global Media Holdings called AtomTelevision. Salmi has been approached numerous times since his company's start with offers of starting a cable TV channel, but the timing and details were never quite right. Now with more than 2,000 items in its content arsenal and

in the late first quarter or second quarter of 2003, the company will debut its own 24/7 cable TV station. There will be music videos, sports clips, thrillers, comedies—nearly anything and everything. (Porn remains the exception. According to Salmi, one of the first questions Sony asked when approached by Atom was what "extreme" content meant.) Working with clips that are usually well less than 10 minutes long, you won't find detailed show descriptions on your regular cable menu. For that, you can check out www.atomtelevision.com.

Atomic Force

Salmi notes that most cable TV channels require seven to eight years to become profitable. Thanks in part to the station's low overhead, he expects AtomTelevision to run in the black in only four to five years. Part of what bolsters the station may turn out to be a relatively new breed of videos called advertainment. AtomFilms has already done deals with Volkswagen and others to develop and show short

five years. The rise of broadband (about 70% of AtomFilms viewers have high-speed lines) won't mean longer video files. Instead, the additional bandwidth will likely result in larger video windows and more varied types of ecommerce offerings. Remember that Shockwave's multiplayer game offerings are still largely confined to simple titles such as Reversi and Backgammon. There's a lot of growing room for Atom's offerings across the board.

Although most of its late-'90s cousin companies have vanished, AtomShockwave remains to reintroduce us to a kind of entertainment that has largely disappeared from our culture. Whether you're too young to remember "Thriller" or too old to care about it, give Atom a spin. Short format is poised to be the next big thing—again—and you may just find that a five-minute ride into unknown territory will open your eyes to a whole new world. **CPU**

by William Van Winkle

THE ROAD NEVER TRAVELED.

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Coder's Corner: XML

XSLT: Transforming XML

The last two months we've looked at XPath, the language XML uses to reference places, or nodes, in an XML document. XPath is an important core XML technology but is useful only in the context of an XML processing environment. Such environments use XPath expressions to reference and process nodes. One important environment is XSLT, an XML language for processing and transforming XML into other forms of data. This month we'll introduce the principles and history of XSLT, plus give an overview of how it works.

A Bit Of History

XSLT was the third official XML specification from the World Wide Web Consortium. XML 1.0 (February 1998) was first, and XPath (November 1998) was second. The XSLT and XPath specs were actually released the same day, which is a good measure of XSLT's dependency on XPath.

XSLT, or Extensible Stylesheet Language Transformations, was originally intended as a small part of a larger specification for XSL, a stylesheet language for XML. XSL was intended as a complete formatting and layout language for XML being rendered either on a graphical display device or in print. You can roughly think of XSL as a superset of CSS (Cascading Style Sheets), with support for complex formatting and layout features, such as pagination, indexing and cross-referencing (by page or section numbers), recursive numbering and indexing, etc. In this context, the transformation portion of the language would provide most of the tooling for mapping the XML data into the correct formatting objects, for calculating pagination and cross-referencing numbers, and so on.

Work on XSL began long before XML 1.0 was released. However, the XSL specification became large and unwieldy, largely due to the complexity of defining the language's formatting and layout

aspects. There was also an urgent need/demand for the transformation portion of XSL (independent of the formatting part) because this could be used for many purposes other than formatting and layout.

Consequently, the XSL specification was split into two parts: XSLT for transformations and XSL for the rest. The XSLT specification was released soon after XML 1.0. Further XSL development was slower, and the final XSL specification wasn't released until three years later in October 2001.

How XSLT Works

Operationally, XSLT is implemented by software called an XSLT processor. These are typically built on top of XML parsers that handle incoming XML data and that may also produce XML output. The XSLT processor reads in two data streams: an XML document (the input data to transform) and an XSLT style sheet to apply to the XML document. Such processors typically use the XML parser to convert the incoming stylesheet and XML data into in-memory object models. The XSLT processor can then quickly search the stylesheet objects to find portions of the transformation components it needs to use or to access the portions of the input data (referenced via XPath expressions) relevant to a given transformation rule. The XML data is typically stored as a data tree (much like a DOM tree), as it's easy to search such a structure based on XPath expressions and easy to extract appropriate pieces of data for processing by the stylesheet.

After completing the transformation, the XSLT processor spits out a third data stream, namely the result of applying the XSLT style sheet rules to the input data. In many cases this output is XML; one of the main uses of XSLT is to transform input XML into another form of XML (for example, numerical XML data into an SVG graphic or XHTML document). The output data doesn't need to be XML. XSLT also supports output modes for

producing HTML (useful for sending output to a Web browser) and a “text” output mode for producing plain text data. This latter mode may seem odd, but it’s very useful for producing non-XML data, such as comma-separated value data for a spreadsheet or Java program source code.

A Truly Trivial XSLT Example

Of course, XSLT is written using XML. The following is a simple example:

```
<?xml version="1.0" ?>
<xsl:stylesheet version="1.0" xmlns:xsl=
  "http://www.w3.org/1999/XSL
  /Transform">
  <xsl:output method="xml" indent="yes"
    />

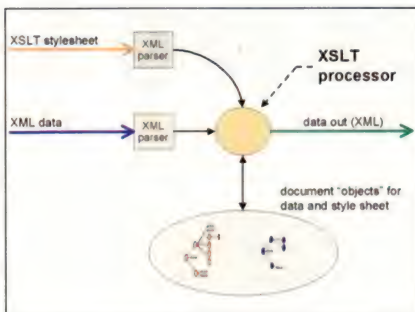
  <xsl:template match="/">
    <dataOut>
      here is some output text.
      </img>
    </dataOut>

  </xsl:template>
</xsl:stylesheet>
```

The XSLT language has the namespace URL <http://www.w3.org/1999/XSL/Transform>, so the second line in the example means that elements with prefix `xsl:` are XSLT. The `version="1.0"` attribute means that this document complies with the XSLT specification version 1.0. Work is now underway on XSLT 2.0, which will use the same namespace URL but a different version number.

Every XSLT document is contained inside a single `xsl:stylesheet` element (we’re using the prefix `xsl:` to indicate XSLT elements or tags here). The `xsl:output` element defines how the output of the transformation should be done. The default is to produce XML output (`method="xml"`). This supports two other possible values: `method="html"` for HTML output and `method="text"` for plain text. The `indent="yes"` attribute tells the XSLT processor to indent the start tags and begin each start tag on a new line (relevant only for XML or HTML output modes).

Templates contained within `xsl:template` elements define the XSLT transformation rules. A template is simply an output rule



This image depicts a graphical illustration of an XSLT processor. Modern processors may also support data validation of the input streams, using XML schema or DTDs.

that applies to specific elements in the input data. Where a template applies to is defined by the `xsl:template` element match attribute. The value is an XPath expression that defines where the rule applies. In the example, the expression selects only one element, the document’s root element, so this template applies to only this one node.

An XSLT processor works starting at the root node for the XML document, looking for templates that match to that node, as defined by the match attribute. If it finds such a node, it follows the rules defined in the template. The template can contain text and XML markup to “print” to output, plus XSLT expressions to evaluate so as to generate output. The example contains just some text and XML data and no further XSLT expressions.

To illustrate this, we’ll apply this example stylesheet to a simple XML document:

```
<?xml version="1.0" ?>
<?xml-stylesheet href="test1.xml" type=
  "text/xml" ?>

<data>
  <item>
    <name>Marie Curie </name>
    <birthday>7 November 1867</birth-
      day>
    <birthPlace>Warsaw, Poland</birth-
      Place>

  <favouriteColor>green</favouriteColor>
  </item>
  ... more items ...
</data>
```

The example consists of five item elements, each containing information about

a famous physicist. Note the `xml-stylesheet` processing instruction. This is a standardized mechanism for indicating a style sheet to use when processing a document.

Applying the example stylesheet to the example XML document yields the following result:

```
<?xml version="1.0" encoding="UTF-
  16"?>
<dataOut>
  here is some output text.
  </img>
</dataOut>
```

The output is the content of the single `xsl:template` element. As the XSLT processor started processing the data file, it found this template matching the root node. The product of the template is simply the chunk of XML data inside the template element.

Changing to `method="html"` changes the output to:

```
<dataOut>
  here is some output text.
  </dataOut>
```

There are two important differences. First, the XML declaration is removed, as this is no longer correct. The output is HTML and not XML. Second, the end tag for the `img` element has been removed. An XSLT processor that can handle HTML mode (not all can) understands the special nature of “empty” HTML elements such as `img` and produces appropriate HTML-style output.

Changing to `method="text"` produces:

```
here is some output text.
```

In text mode, markup is stripped from the output (each output node is processed to produce the string value of the node).

The Power Of Recursion

The proceeding illustrates ideas behind XSLT. Next month we’ll look at recursive processing within XSLT templates, which gives XSLT most of its power. **CPU**

by Ian Graham

(NOTE: Full examples of the documents in this article are available at www.utoronto.ca/ian/articles/jan03.)

Conducting A Site Audit

When I put a redesign proposal together for a client, I like to take a good look at their existing Web site to understand its structure and to look for obvious design flaws. As a designer, I am in luck because I have a fresh, unbiased eye and can often times spot problems that the client cannot see or never knew were there.

Heart Of Darkness: The Descent Into The Arcane

The biggest error you'll often see in a Web site is the company's word choices. Semantics, as I mentioned in my user testing columns, account for many of a site's usability problems. If you've ever worked in a large company, you know that the top brass spend hours trying to distill what it is the company does down into a few heavy words that sound important to investors and to each other.

During these brainstorming sessions, the words and phrases become increasingly abstract so that they do not pigeonhole the company's value proposition but instead leave the door open to future expansion. For example: If a company provides next-day shipping services, it may feel that the biggest value to its customers is not shipping but the complex planning that goes along with it. It avoids words and phrases like "delivery" and "immediate shipping service" in favor of "supply chain logistics management and execution"—whatever that is! The feeling is that the latter phrase allows the company to do more than just ship packages and ultimately provide expensive consulting services about how best to move stuff from point A to point B.

The problem with this natural brainstorming process, however, is that these abstract words—jargon—end up on the home page in the form of a tag line or main headline when they should just stay on the white boards. Fresh customers coming to the Web site don't have the benefit of the thought process that led to the arcane headline and are immediately confused. Part of my job as a designer is to spot such words and phrases, ask

what they mean, and offer more digestible alternatives. If I don't "get it," neither will the customer, and that makes the Web site almost useless.

Visual Language

Along the same lines as semantics, the other thing you'll notice as a novice visitor is the visual posturing of the site—the design and the layout. The look and feel of the home page can tell you a lot about the company. Does it look like a conservative, established company with a buttoned-up look? Is the site full of rich colors and imagery—suggesting an innovative, entertainment, or consumer company? The visual design of the Web site must

accurately reflect the image the company wants to project. After all, the Web site is often a customer's first encounter with the company's brand.

Finally, make sure your home page does not have too much information competing for attention. The main section of the home page is your opportunity to lead new visitors on a journey of your choosing! The navigation is there for the repeat folks to get where they need to go quickly. Make the biggest area of the home page focus on one message

The main section of the home page is your opportunity to lead new visitors on a journey of your choosing! The navigation is there for the repeat folks to get where they need to go quickly.

with a link to learn more.

Design Audit Exercise

Here's something you can try at the office. Take a screenshot of a company's home page and shrink it down to 25% in a graphics program. Can you still read the main headline? Is there one clear place for your eye to begin? Draw boxes over it that reflect the overall color intensity and size of the sections you see. Are there too many boxes competing for your attention? Is there a logical layout? Now, draw a series of colored boxes that you think are more readable. ■

You can contact Lisa at lopuck@cpumag.com and see her work at www.lopuck.com.

Lisa Lopuck,

www.lopuck.com, is now offering "Web Power Tools Primer" courses at her Web site. They are fully downloadable multimedia courses on Flash, Dreamweaver, Fireworks, and Photoshop. Lisa is a long-time Web consultant, the author of numerous best-selling books on Web design, including "Web Design for Dummies," and a sought-after speaker at Web conferences and universities around the world.

switched.txt



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

I am a Linux User. I adore having source code at my fingertips. I love messing with beta kernel modules to try to access hardware that is unsupported by vendors. I love taking programs I like and writing terrible patches to add features useless to anyone but me.

I am also a Unix user. I like my pipes and command lines. I love editing a text file in /etc, sending SIGHUP to a process, and never rebooting except when I install a new piece of hardware. And oh god, yes I love vim—the text editor I crank out everything from Perl to this very column in.

But I also love eye candy. I love glitz. I love UI fluff—transparency and animation. But really I love well-designed, consistent user interfaces. The stuff that just makes sense. The stuff that just works without wracking your brain wondering "Is this the right way to do this?"

Today I'm writing this column on a Mac. My fiancée has long lorded her lovely Macintosh over me. And for years I was able to ignore her taunting. I could sleep easy at night knowing that her computer was merely a toy. Its simple interface was sufficient for graphic design and perhaps a light load of email, but only my precious Unix could be powerful enough for an egomaniacal super user such as myself. Anything else was for children.

Of course, you can guess where this is going. OS X reinvented the Apple operating system. By basing the next generation on NeXT and Unix, the shaky Apple Core was replaced with the very system that I know and love: that thing that gives me X11, vim, sockets, pipes, and command lines.

With 10.2, Apple has finally made the Unix underlying its OS a force to be reckoned with. As I said earlier, I am a Linux User. I am a Unix User. But today, I can honestly say that I am also a Mac User. What convinced me to move? The slick interface? The genie effect for minimizing windows? Of course not (of course, it doesn't hurt!); what convinced me was popping open Terminal.app, fiddling with a few settings to make it transparent, and then switching over to bash and editing /etc/hosts and

being able to ssh into my router without installing anything.

Then I discovered fink (fink.sourceforge.net) and it was all over. Fink is a port of Debian's amazing apt: the greatest package manager I've experienced. Installing Mozilla, X11, or any of thousands of applications, is a simple command line operation away. And fink gives me that same level of efficiency on the Macintosh. Hell, I can install GNOME, KDE, and most any of the major applications.

I have options: I can use SpamAssassin & KMail. Or I can let OS X's default Mail application have first crack at my email. Its own internal spam checking works pretty well and seems to be getting smarter every day. Or I can set up some sort of convoluted hybrid, using local IMAP servers, Procmail, or whatever other bizarre concoction floats my email boat down the river.

My point is that the choices are all here. Apple finally took the Unix that I know and love and made it pretty. They made it usable. And they made it possible for my fiancée and I to share an OS. Five years ago I wouldn't have believed it possible that the laughable Mac OS would throw off its shackles and become not only usable but simply a great OS for users of all skill levels.

Will the Mac replace Unix? Of course not. These days Unix, and especially Linux, is a solid desktop contender. Sure, it lacks access to some of the sexier file formats that you'll encounter on the Internet, but development is rapid, and the availability of source code ensures that it will also be a thriving place for development to occur outside the bubble of the corporation. Its low price makes it ideal for educational installations or places where older hardware is all that's available. OS X gobbles up RAM and CPU as if not doing so risks losing it.

So I'm writing this in Mac OS X. But I'm still running vim. Best of both worlds. ■

**Today I'm
writing this
column on
a Mac.**

Complaints can be sent to
/dev/null because it's cross platform now.
Compliments can go to malda@cpumag.com.

Leaks & Waves

Doom III Demo Leak

This column was supposed to be about how much things have changed. How we have matured as a computer gaming/enthusiast community. How the wild, wooly west of www forums and fan sites has evolved into respectful discussion and responsible journalism. How we've actually improved our spelling . . .

My inspiration for this surprising topic came from reading the large volume of feedback posts regarding the recent unauthorized leak of id Software's Doom III demo. Frankly, I was shocked. Not only did a strong percentage of comments demonstrate an understanding and appreciation of copyright law and non-disclosure agreements, much of it was actually critical of the leak. There was significant discussion about the inappropriateness of linking to the download and screen shots, with many id fans vowing not to download it, preferring to wait until something was officially ready for viewing. And I'm not just talking about historically responsible sites like Blues-News.com, which did not even mention the "story" until id's John Carmack had made a public statement acknowledging the leak. I'm referring to that bastion of geek freespeak, Slashdot.org (sincere hat tip/curtsy to fellow columnist CmdrTaco). There was even sympathy expressed about the emotional impact of the leak on the developers. I know things have been changing, but when did it go all touchy-feely? But maybe the reaction would have been different if the leaked demo was from some nobody developer with great content but no entrenched following. Maybe id should get special consideration because it is . . . id.

So that was going to be the topic of this column, but then a funny thing happened: TechTV, the best geek channel on the air, aired a live segment on *Screen Savers* that included hosts Pat and Leo playing the demo. The reruns were cancelled and the station apologized (sort of), but nobody got punched or sued. Go figure.

Virtual PR

So instead, I thought I'd write about the GeForce FX launch. We were all looking forward to it, but the delays had brought a fatalistic whiny

attitude. Are we there yet? When can we see a real board? Then it happened. . . . Like a virtual wave, the GeForce FX PR machine rolled across the Web that first morning of Fall Comdex 2002. I remember it like it was this morning.

There had been tiny trickles building over the weekend, mostly posted in languages Google can't even pseudo-translate. As the leaks spread in hushed tones to the fan sites: "Surely not! No . . . they couldn't actually be calling it GeForce FX?" A nicely timed (inadvertent?) technical paper link posted on nvidia.com confirmed the name, then quickly disappeared.

The first real item appeared Sunday night (dated Monday, of course) on an investor site, "Is it real, or is it digital?" An excellent question! The next biggie was where CNET news veteran John Spooner mis-

spelled VP Dan Vivoli's name, "We're trying to come up with a graphics processor that can create in real time (on a computer) . . . what happens on the cinema screen' . . . NVIDIA designed the chip using a newer, 130-nanometer manufacturing process. This

'put the schedule behind what some people might have expected,' Vivola said." Wait a minute . . . some people? Does he mean us? The unwashed masses of gamers (not to mention investors) who inhaled every leak and rumor as NVIDIA repeated the mantra all through summer and fall, "we will make Christmas, we will make Christmas." We wanted to believe, but all the wanting couldn't make it so.

Soon *The Register*, then *The Inquirer* (which had very classily NOT revealed the GeForce FX name a few days prior), added to their bounty of prerelease mockery. The wave was beginning to build: 27,000 "GeForce FX" Google results jumped to 32,500 in only 22 minutes. Wait, that can't be true. But it was. It really happened. I saw it. I saw the wave!

Maybe it was an apparition. It's possible I suppose. I haven't slept in days. I am completely surrounded by printouts of NVIDIA white papers. And I'm questioning why I ever wanted to understand vertex shader instructions. My mouse thumb has gone numb. Anybody know how to get rid of werewolf fleas or cure a pixie dust rash? ■

Send virtual straitjacket to joan@cpumag.com.

27,000 "GeForce FX" Google results jumped to 32,500 in only 22 minutes.

Starting as gopher for the Emmy-winning team that pioneered live in-car TV cameras for the Indy 500, Joan became an independent video/sound engineer, technical director, and producer. Playing with Reality Engines and motion platforms led to co-founding Xatrix Entertainment, where she produced the two Cyberia games. Before 3D acceleration was trendy, she formed Mango Grits to develop hardware-only game Barrage for Activision. Since cashing out from SharkyExtreme.com, where she was co-founder and managing editor, Joan has retired.



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What drives you to Plextor? For work and play, the PlexCombo CD-RW/DVD-ROM is a blockbuster. Catch Plextor's latest attraction at www.plextor.com.



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PlexWriter 40/12/40A



PlexWriter 40/12/40A



PlexWriter 24/10/40A



PLEXTOR®

Road Warrior

Tungsten's Debut, Palm OS 5.0 Compatibility Checkup, Dana's On The Scene, A PowerBook Look-Alike & More From The Mobile Front

Palm OS Software Checkup

Remember those compatibility hiccups during the transition from Windows 3.1 to Windows 95? Most Win3.1 applications ran on Win95, but a few simply refused to work. A similar thing is occurring in the Palm OS world.

A few older applications probably won't run well under the emulator that Palm OS 5.0 uses for older applications. If you have your eye on the Tungsten T, Sony's NX70V, or any other Palm OS 5.0 PDA, you'll want to check out Palm's Third Party Product Compatibility Web page (www.palm.com/support/tungstent/compatibility.html).

Popular Palm OS 5.0-ready applications include Documents To Go (bundled with the Tungsten T), Cutting Edge Software's Quickoffice, and Bejeweled (in case you haven't wasted enough hours of your life playing that game already). We should see better support for Palm OS 5.0 in coming months. ▲

If Your Palm & Notebook Had A Child . . .

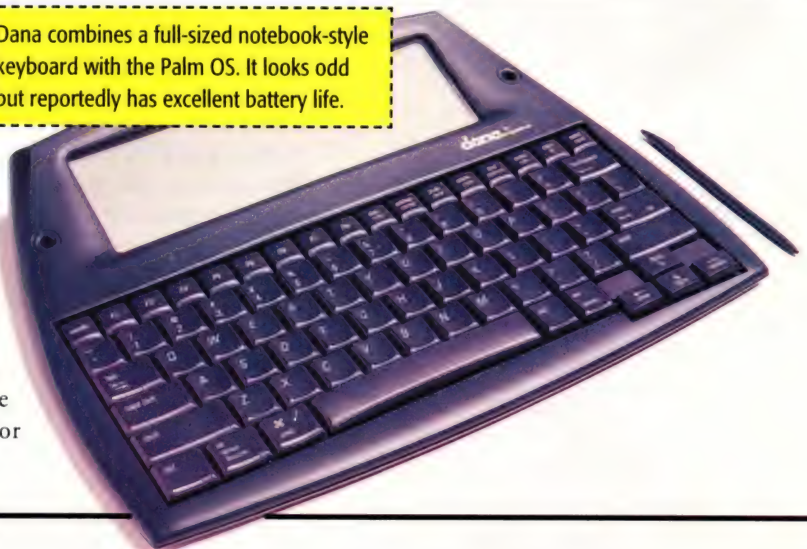
Dream as we might, it's unlikely too many of us can replace our notebooks with a PDA. It's not a matter of performance; most PDAs can perform simple word processing and spreadsheet chores easily enough. The real problem is that a PDA's form factor, specifically the display, doesn't lend itself to extended use. Of course, there's nothing to stop some mad scientist from splicing your Palm with your notebook.

At first sight, AlphaSmart's (www.alphasmart.com) Dana looks like some sort of sin against nature. It's a \$399 Palm OS device with a full keyboard and wide display that better lends itself to word processing and spreadsheet applications. Measuring 1.9 inches high x 12.4 inches wide x 9.3 inches deep, the Dana isn't exactly pocketable, but at just 2 pounds, it does appear a bit more portable than many notebooks (not to mention being much, much cheaper).

The Dana uses a grayscale display and runs Palm OS 4.1. It does include two USB slots to connect to a PC or a USB printer and includes an SD/MMC slot, as well as an infrared port. Because it runs the Palm OS, Dana will run any Palm OS application (well, not Palm OS 5.0 apps, obviously) and includes the Microsoft Word-compatible AlphaWord word processing application, as well as Cutting Edge Software's Quickoffice app.

Another benefit is the Dana's flexible energy source. A rechargeable Li-Ion battery is available, but you can also run the unit on three AA batteries, and of course, A/C power is always an option. Because it uses the Palm OS and doesn't have a large color LCD, battery life is reportedly quite good. ▲

Dana combines a full-sized notebook-style keyboard with the Palm OS. It looks odd but reportedly has excellent battery life.



Anyone Remember Stinger?

Sure you do. Stinger was Microsoft's (www.microsoft.com) code name for its Smartphone OS. Initially, Microsoft felt hardware would be available sometime in 2001, but things didn't quite work out as expected. Despite the delays, however, Microsoft finally announced hardware based on Stinger in late October. As you've probably guessed, the announcement was made in London. We in the States will have to bugger off until sometime in 2003 when the phones will finally make it across the pond. Seriously, why can't we ever get the cool wireless gadgets first?

British carrier Orange SA began offering the Orange SPV (Sound, Pictures, Video) on Oct. 28, six days after Microsoft's initial announcement. In the United States, AT&T Wireless expects to offer support for phones running Microsoft's Smartphone 2002 software (why do the code names always sound better than a product's official name?) sometime in mid-2003. Cingular, Verizon, and other overseas providers have also announced support for the platform.

A handful of Pocket PC devices, such as the Toshiba 2032 (\$799.99; www.sprintpcs.com), already support voice, but Microsoft designed the Smartphone 2002 software specifically for mobile phones. Rather than looking like a PDA with an antenna, Stinger-based devices will look more like traditional phones but will offer a number of enhancements, including support for wireless data and color displays. ▲

Palm Unveils Tungsten

All the rumors that typically accompany a release from Palm (www.palm.com) often make the actual announcement somewhat anticlimactic. In late October, Palm finally made the Tungsten T series official and confirmed what many PDA enthusiasts were already expecting.

The Tungsten T is the first Palm PDA to feature Palm OS 5.0. The new OS provides a number of long overdue enhancements, including support for faster processors, higher resolution displays, and

enhanced audio capabilities. The Tungsten takes advantage of the newly supported features by including a Texas Instruments OMAP 1510 ARM processor running at 175MHz, a 16-bit reflective TFT display that has a 320 x 320 resolution, and a stereo headphone jack.

Additional design features include a five-way navigation dial that replaces the old scroll buttons. The bottom portion pulls down to reveal a hidden Graffiti area. The Tungsten T's introduction also brings integrated Bluetooth to the Palm platform. Other features, including an SD/MMC slot and a Palm Universal Connector, are typical of high-end Palm products.

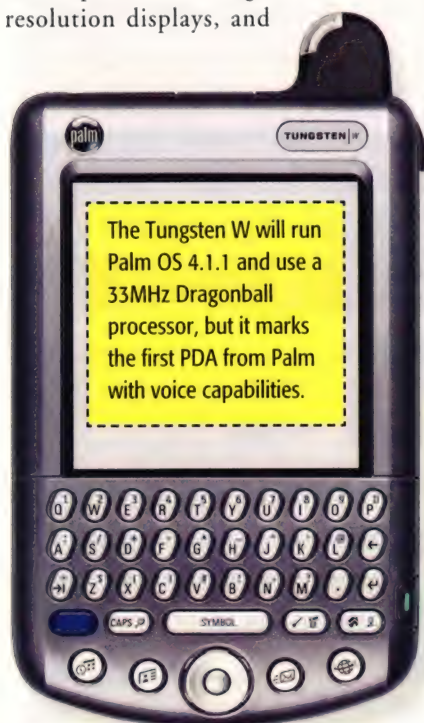
At \$499, the Tungsten T debuts at \$50 more than any other high-end Palm device. At this price point, the Tungsten T competes more directly with the traditionally more expensive Pocket PC devices that have included multimedia features for some time.

Palm also announced the Tungsten W, its first PDA to support voice. The Tungsten W is compatible with GSM/GPRS wireless networks, and Palm has announced partnerships with AT&T Wireless in the United States, Rogers AT&T Wireless in Canada, Vodafone in Europe, and SingTel in Asia.

Although the Tungsten W will handle voice, it's clearly intended to be a PDA



The Tungsten T runs Palm OS 5.0 and features a 175MHz ARM processor (a nice improvement from the 66MHz Dragonball).



The Tungsten W will run Palm OS 4.1.1 and use a 33MHz Dragonball processor, but it marks the first PDA from Palm with voice capabilities.

first and a phone second. The Tungsten W is very similar to the Tungsten T but has a small keyboard instead of a Graffiti writing area and doesn't run Palm OS 5.0. Instead, it runs Palm OS 4.1.1 on a 33MHz Dragonball VZ processor.

The Tungsten W will sell for roughly \$549 without service. The actual price will vary depending on the carrier and if the PDA is bought with service. Palm expects availability of the Tungsten W early next year.

Anyone want to guess the over/under on battery life? ▲

Movie Making At 30,000 Feet

In late October, several notebook manufacturers announced new notebooks that include DVD-RW drives. Toshiba's (www.toshiba.com) Satellite 5205-S703 includes a DVD-RW drive and sells for roughly \$2,700. Some models in Sony's (www.sony.com) VAIO GRX series are shipping with a DVD-RW drive, as are models in its new NV series. VAIO models with DVD-RW drives start at roughly \$2,500. Fujitsu (www.fpc.fujitsu.com), however, offers the best price on a DVD-RW-equipped notebook we've seen. Its LifeBook C2210 ships with a DVD-RW drive for \$1,899.

Considering that the DVD-RW drive doesn't seem to substantially add to the price, we'll probably see DVD/CD-RW combo drives slowly phased out in favor of DVD-RW drives on high-end notebooks. ▲

No, Really, It Is A Porsche

All we can say is that a notebook designed by Porsche better be fast. Founded by F. A. Porsche (who designed the body of the Porsche 911), Porsche Design GmbH designs desktops, monitors, mice, and yes, notebooks for vpr Matrix (www.vprmatrix.com).

With a 15.2-inch wide-screen display and magnesium case, the vpr Matrix 200A5 brings about instant comparisons to Apple's PowerBook (minus the OS X goodness, of course). The vpr Matrix 200A5 comes with a 2GHz Pentium 4-M processor, a 40GB hard drive, 512MB of DDR SDRAM, a GeForce4 420 Go graphics chip with 32MB of video memory, and a DVD/CD-RW combo drive for just a hair less than \$2,400. For some of us, it may be the only Porsche we'll be able to afford. ▲

WE'VE LANDED

BETTER LATE THAN NEVER, RIGHT?

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CPU Web Log

Check the time on your fossilized Palm.
Time for you to play Dick Tracy. But first you'll need to pick up Fossil's new WinstPDIA next spring. Yes, it's a PDA in a wristwatch form factor. And

by David Huxford 1/27/03 10:02 AM EST

NVIDIA's GeForce FX
NVIDIA has been showing their next-gen card (previously known as NV30, now dubbed GeForce FX) at Fall Comdex 2002. Two versions of the card have been

by David Huxford 1/27/03 9:45 AM EST

60GB for \$40. Yeah!
OK folks, head over to Staples.com and search for item #448145 to add a Maxtor 7200rpm 60GB drive to your cart. That should cost you \$99.94. Now search.

by David Huxford 1/27/03 9:45 AM EST

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Holiday
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Part II

At Your Leisure



Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in PC entertainment, DVDs, consoles, and just stuff we love, read on.

Combat Flight Simulator 3: Battle For Europe

We love WWII air combat. Aaah, there's nothing like old-style dogfighting. One feature we were especially excited about was the game's ambitious dynamic campaign where your in-flight combat performance



CFS3 features top-notch graphics optimized for high-end hardware.

directly affects the course of the war in the area you're battling. The stellar graphics are nothing to sneeze at if you're playing on a very high-end PC (and what *CPU* reader wouldn't?), but don't expect that beauty after you scale the game back to play on today's average machine. The terrain looks beeyootiful from the air, and planes themselves are pure eye candy delight in flight. And let's not forget those clouds: CFS3 produces some of the best clouds yet seen in any game. Plus, you'll need those pretty clouds for cover when battling the enemy in the unfriendly skies.

We've established how good the game looks, but you'll quickly notice

some issues with allied/enemy AI during combat. Several flights later you'll get the idea that dynamic campaigns were not adequately play tested before release: only the most patient players will persevere enough to make progress. You arm-chair pilots will have 18 planes at your disposal, but oddly, outside those 18 planes, there won't be any other planes in the air. (Yes, there were more than 18 planes available in service from 1943 to 1945.) On the plus side, CFS3 lets you fly bombers (unlike CFS2), and that's a tasty treat.

You'll be disappointed if you're expecting an innovative classic like *Secret Weapons Of The Luftwaffe*, but that's not to say CFS3 isn't fun. On the contrary, there's a very good time to be had here, but it's not the classic we wanted it to be. We're not giving up hope, and perhaps

Microsoft will address the problem with a patch sometime soon.

Combat Flight Simulator 3 (PC)

\$49.95 • Microsoft Game Studios
www.microsoft.com/games/PC

Microsoft's SideWinder Force Feedback 2 joystick has gotten some purely cosmetic updates (the red accents and new packaging), but what remains is one of our favourite force feedback joysticks. The stick retails for \$99.95, but we've seen it as low as \$60 (after rebate) with free shipping through online vendors. A few hours of CFS3 with this joystick's features reminded us how much they improve the suspension of disbelief during gameplay. Microsoft Flight Simulator 2002 fans should take note, too. Happy flapping.



Check These Out On The Web

See our reviews of Sony's *Wild Arms 3* (PS2), EA's *Ty The Tasmanian Tiger* (PS2, Xbox, NGC), and MS's *Blinx: The Time Sweeper* (Xbox) at www.cpumag.com/cpujan03/gamereviews.



Unreal Tournament 2003 Rawkin' Multiplayer FPS Evolution

Unreal Tournament 2003's graphic engine reigns supreme for the time being. (Wait until Doom III.) Oddly, UT2003 *feels* more like Quake III and is hellaciously addictive but doesn't offer anything revolutionary in terms of gameplay. With that new "2003" designator, we can expect to see upcoming versions in much the same manner we see new Madden games every year.

Physics (we really like the Karma Physics), modeling, and in-game atmosphere are all dead-on, while the audio is more of the same. (C'mon, please lose the annoying narrator.) Fans will immediately notice that you can no longer queue up six rockets with the rocket launcher (though you can queue up three in the alternative fire mode). The lightning gun (it's a rail gun/sniper rifle combo) replaces the sniper rifle and lets opponents track your location. (Campers beware.) And there's other stuff

UT fans will probably notice within a few rounds of CTF or deathmatching.

One innovation in UT2003 is the adrenaline boost. You get adrenaline points for kills and by picking up pills



The popular CTF mode makes a welcome return in the sporting Unreal Tournament 2003.

along the way. Once your adrenaline meter hits 100, you will be able to pull off special moves (speed, invisibility, berserk, etc.) for a limited time. There's

Shenmue II Story Is King

Shenmue II was developed by Sega AM2 as an Xbox exclusive. You take on the role of Ryo as he arrives in Hong Kong seeking to uncover the murderer of his father. A movie DVD chronicling the first Shenmue (for Dreamcast) is bundled.



"So you want to fight, blue twins? If that is so, then I will take my powerful fight to you here."

The game plays out as a genre-bending RPG-adventure, fighter, and puzzle game that's difficult to categorize.

We were at first put off by the voice acting, but we began to really enjoy the game as we focused on the gameplay, in-depth (and very cohesive) story, and the characters. There are few repetitive functions you'll have to perform to make money, but soldier past these, and you'll discover a living, breathing Hong Kong. The artwork is attractive, but the updated graphics are not on par with what the Xbox is capable of. Part of the game's RPG element will have Ryo improving his fighting skills. The fight portion of the game is based on the Virtua Fighter engine (including some VF4 upgrades), so it's very well implemented and lots of fun.

There's a lot going for Shenmue II, but the slow pacing and poor voice acting may steer casual gamers away. If you're unsure, do yourself a favour by renting the game before you buy it. Stick with it, and you will be well rewarded.

Shenmue II (Xbox)

\$49.99 • Microsoft
www.shenmue.com

also a new game mode, Bombing Run, which tries to inject a sports-style aspect into gameplay. Do you like multiplayer FPS action? If you answered yes to the question, then you'd do well to pick up a copy of UT2003 now. If a single-player storyline game is more your bag, wait for the upcoming Unreal II: The Awakening.

Unreal Tournament 2003 (PC)

\$49.99 • Atari Games
www.unrealtournament2003.com

DVD Byte by Todd Doogan

"Glengarry Glen Ross" is one of those films that sucker-punches you and takes you in. No one going into "Glengarry" 10 years ago knew what to expect. Written by David Mamet, based on his award-winning play, Mamet went in and added a new opening, which not only sets the film



up, but ended up becoming one of the most talked-about scenes of the last decade. It's an awe-some scene, and an equally incredible film. On DVD,

"Glengarry" looks wonderful. The full blacks and perfect detail go a long way toward showcasing a film taking place on a dark rainy night. The sound work is also superb with English Dolby Digital in 2.0 and 5.1 as well as DTS. The extras are hit or miss with several clip reels, shorts, and documentaries that take you into the world of sales, the acting profession, and the life of the late great Jack Lemmon. The best thing on the disc is a running commentary by director James Foley, who tells some great stories about the stellar cast and the shoot. It's not very hard to recommend this film and this DVD to everyone. ▲



Commandos 2: Men Of Courage Stealth & Trickery Rule The Day

After launching on PCs in 2001, the second installment in Eidos' previously PC-only Commandos series is now available for PS2 and Xbox, as well. The game features the familiar three-quarter overhead view, boatloads of graphical detail, a cast of elite military operatives who specialize in various aspects of combat and espionage, and a pretty stiff challenge.

Set in World War II, C2 rests on the premise that the Allies have gathered a small force made up of operatives (and one dog) from several countries who will go behind enemy lines and use their special skills to make things easier for allied military units. Once the game begins, you'll take control of nine unique units, directing their activities with a point-and-click interface that is extremely versatile but also a little complicated until you get the hang of it. Your commandos will receive a variety of missions



The missions in Commandos 2 include plenty of opportunities to blow up and otherwise sabotage German and Japanese vehicles and equipment.

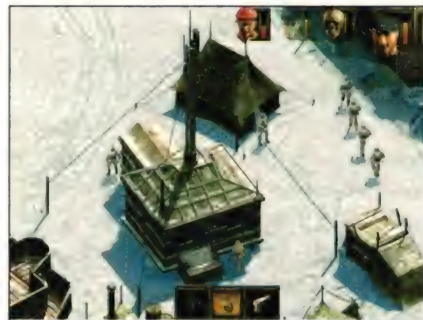
designed to disrupt the Axis powers' operation in northern and central Europe, as well as Southeast Asia and islands in the Pacific.

The great thing about C2 is that although its missions' objectives are obvious, the solutions to reaching them generally aren't, leaving you to use your

noggin quite a bit. There are many ways to approach your missions, but most players can expect to start missions over a time or two in the course of figuring out what works and what doesn't. If you like strategy and really want to earn your victories, Commandos 2 has your number.

Commandos 2: Men Of Courage
(Xbox, PS2, PC)

\$49.99 • Eidos Interactive
www.eidosinteractive.com



Because you'll undertake missions in all sorts of far-flung locales, Commandos 2 provides plenty of scenic variety.

NBA 2K3 You Can Almost Smell The Sweat



The level of detail in the stadium is impressive; even the mascots and cheerleaders look great.

If you're itching for some pro hoops action, Sega Sports' NBA 2K3 for the PS2, Xbox, and GameCube should scratch it.

The game boasts exceptional graphics; this year's big deal is sweat. That's right; now as the game progresses, you'll see your favorite NBA stars develop a fine sheen of

perspiration. Not that sweat in and of itself is so great, but Sega rightly boasts that it adds to the overall realism of the game. No matter how many times we've been impressed by the dramatically improving graphics in sports games, games like NBA 2K3 still take us by surprise. If you walked through a room and someone in the room were playing the game, you'd think at a glance that he were watching the NBA on TV. It's really that good. The players' faces look pretty accurate, their movements look very natural, and the arenas they play in are faithfully portrayed right down to the rotating banners that run along the sides of the courts.

Of course, as we've said numerous times, outstanding graphics alone don't make a hit, but Sega knows this, as well. That's why second-party Sega developer Visual Concepts gave NBA 2K3 a highly functional yet simple control scheme and scads of play

modes and configuration options. The game plays like a dream, and even if you've never played a basketball video game before, you'll be able to pick the interface up in no time. Once you've got the controls down, you'll be ready to feast on NBA 2K3's smorgasbord of play modes. Of course, you can play quick pickup games, start a season, and play in the playoffs or in a tournament, but NBA 2K3 adds a very fun Street mode, as well as support for online play on PS2 and Xbox.

Like the rest of Sega Sports' 2K3 lineup, NBA 2K3 also boasts the ESPN license, which means you'll see lots of broadcast-like graphics and stat screens. In fact, other than some wearisome color commentary from the broadcast booth, the game really has no flaws. This is Sega's best sports game so far this year, so whether you're an NBA fanatic or you just like sports games, look for The Answer on the front.

NBA 2K3 (PS2, Xbox, NGC)

\$49.99 • Sega
www.sega.com

Ratchet & Clank

The New Dynamic Duo

Anybody who's been playing video games for a couple years knows that platform games with cute, cartoony characters are nothing new. Like most segments of the game market, there are a few special titles out there that really shine and make gamers keep coming back for more. Ratchet & Clank is just such a game.

Ratchet is a biped critter who works as a mechanic, slaving away working on spaceships on a backwater planet and dreaming of adventure, when along comes Clank, a diminutive robot that (as a result of a factory error) was born with a conscience. He is supposed to be part of the evil Chairman Drek's robot army, but his sense of fair play (and his tiny factory-second robot body) won't allow it. He flees the factory and gets

shot down over Ratchet's planet, and the two set off on a journey to save the universe.

Throughout the course of the game, you'll travel to several planets and take on all sorts of nasty intergalactic critters. Ratchet runs, jumps, swims, and climbs, and he also gets to ride jetpacks, helipacks, and various other contraptions as you work your way from level to level. Clank has a few moves of his own and serves as the brains of the outfit.

The game's story: a bad guy is out to ravage helpless planets for his own benefit, and you have to stop him. Plenty of other well-worn platform game conventions are present in R&C, as well, but thanks to spot-on level design, tight control, and a healthy variety of weapons and gadgets,

R&C ranks among the top platform games released in the last several years.



Ratchet & Clank's huge, freewheeling levels and colorful graphics make the game something special.

Ratchet & Clank (PS2)

\$39.99 • Sony

www.ratchetandclankgadgets.com

Grand Theft Auto: Vice City

Lightning Strikes Twice

Last month we offered a quick preview of Rockstar's follow-up title to its unqualified smash hit Grand Theft Auto III, and we're happy to announce that our excitement was well founded. GTA: VC is even better than GTA III and easily one of the greatest experiences to hit any game console, ever. Period.

Like its predecessor, GTA: VC puts you in the shoes of a tough guy on the wrong side of the law and turns you loose in a huge, living city. It lets you go anywhere and do pretty much anything you like, from roaming around for hours exploring to setting out on a quest to rise to the top of the criminal food chain. And just interacting with the city's inhabitants and listening to its nine radio stations are engrossing enough to spend hours on.

But GTA: VC isn't just a rehash of GTA III (see page 91 in our April 2001 issue). It offers a much larger environment to explore, a much wider variety of vehicles to drive (including

motorcycles, helicopters, and a seaplane), and lots of cool new moves and features. For example, you can now bail out of vehicles (even the helicopters!) while they're in motion, a nice change from GTA III, where your character some-



If you get into too much trouble in Vice City, John Law will come after you with a vengeance.

times got blown to smithereens because he couldn't get stopped and get out quickly enough. You can also press L3 to duck in GTA: VC, which comes in handy during firefights. Vehicle damage is back and now includes tires you can

shoot out (and so can your enemies), which dramatically affects drivability.

Some of your favorite radio personalities from GTA III are back, including Fernando and Lazlow, although they apparently had different gigs back in the '80s. Lazlow is the DJ of Vice City's hard rock station, and Fernando plays sentimental soft rock on Emotion 98.3. There are nine stations in Vice City, and they are all amazingly entertaining, thanks to quirky DJs, hilarious talk show segments, and highly amusing commercial breaks. We weren't sure how we'd like the addition of actual, licensed music to the game, but it works like a charm, adding even more entertainment value to a game that's already bursting at the seams with fun.

There are 100 hidden packages to find; tons of L3 missions to complete from within cabs, fire trucks, police cars, etc.; and plenty of death-defying stunts to pull off. If you don't have an absolute blast playing this game, you'd better check for a pulse.

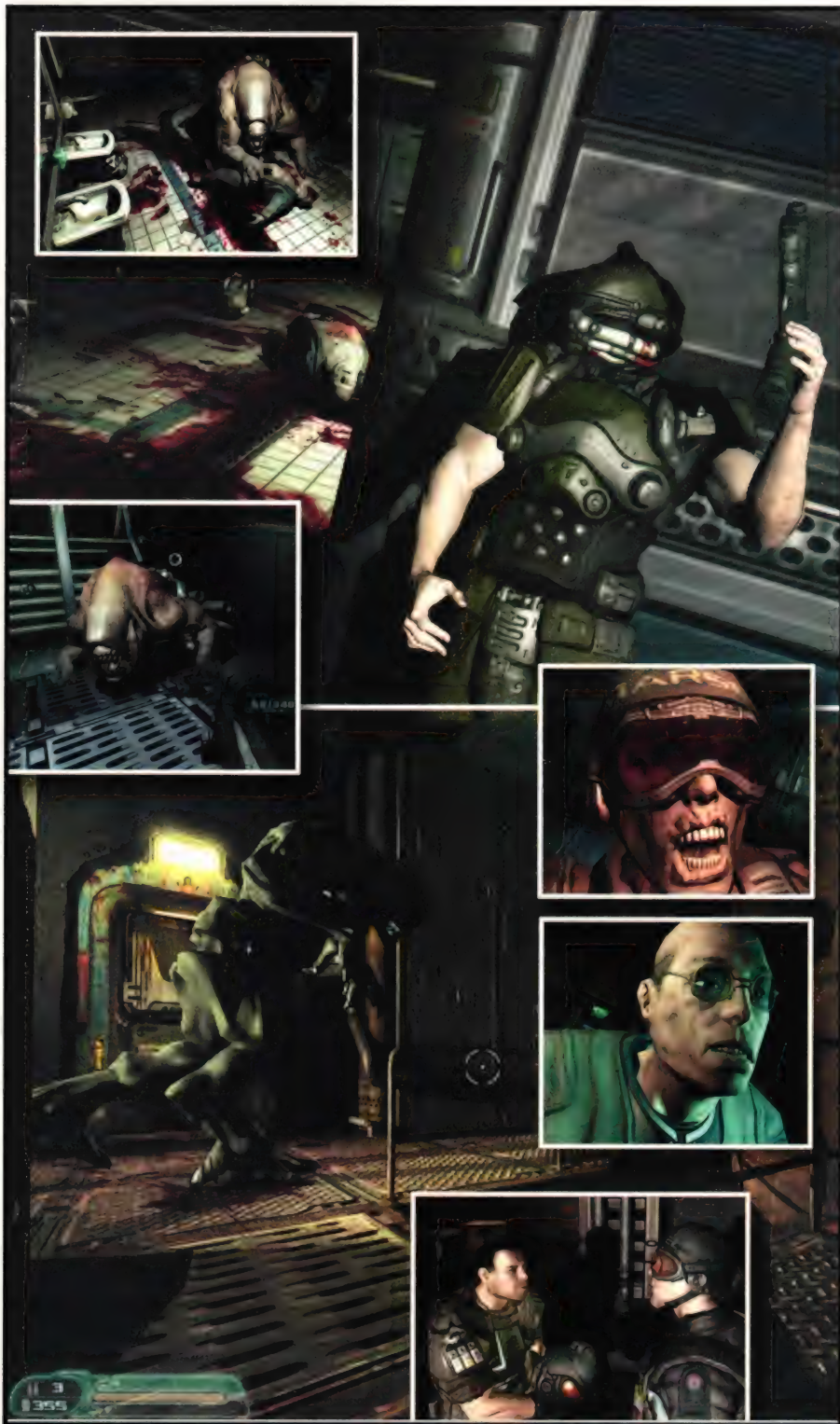
Grand Theft Auto: Vice City (PS2)

\$49.99 • Rockstar Games

www.rockstargames.com/vicecity

Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Sure, there are those who would have you believe graphics are relatively unimportant in the greater scope of things, but if you read *CPU* mag, you probably already know those folks are off their collective rockers. We want great gameplay combined with stunning graphics, and here are two upcoming games that show promise. Watch for them.



Doom III (PC). You've surely heard about the leaked Doom III alpha that recently made rounds on the Internet. Even at this early stage, the nonoptimized graphics engine looks stunning. Ignore the gore and look at the detailed textures and realistic lighting effects. Lovely, eh? A game well worth waiting for in 2003.

Infinite Loop

Pop Quiz: Know Your Inventors

You may know that after leaving Apple Computers, Steve Wozniak organized rock concerts and taught in Silicon Valley schools, but can you match these other inventors with their later achievements?

Inventors:

1. Nolan Bushnell, AT&T founder
2. Douglas Engelbart, inventor of the mouse
3. Wilson Greatbach, inventor of the first implanted pacemaker
4. Edward Herbert Land, inventor of instant photography
5. William Lear, inventor of autopilot and founder of LearJet
6. Luther Simjian, inventor of a teleprompter and the first ATM machine

Achievements:

- a. Invents the 8-track tape player
- b. Founds Chuck E. Cheese restaurants
- c. Develops the Retinex theory of color perception
- d. Invents an indoor, virtual golf practice range
- e. Builds a solar-powered canoe
- f. Founds the Bootstrap Alliance, an organization that promotes the Collective IQ

(Answers: 1.b, 2.f, 3.e, 4.c, 5.a, 6.d)

SOFTWARE TIPS & PROJECTS

Buzzing Around Windows' Serious Registry Editing Tools

AS YOU MAY RECALL FROM OUR LAST SCINTILLATING ADVENTURE INTO THE HIVES AND KEYS OF THE WINDOWS REGISTRY, THERE IS MORE THAN

one way to skin a Registry. Windows' home-grown Registry Editor (Regedit) lets you export and import large pieces of the Registry databases for safer editing outside of Regedit and for applying the same Registry "patches" with the .REG extension to multiple machines. This month we take a look at an even more sophisticated Regedit function now available in Windows XP: editing "hives." By the way, Win98/Me users shouldn't turn the page so quickly. We will flag the tweaks and keys that also work in your versions of the Windows OS.

Hive Management

The topmost branches in the Registry tree, such as HKEY_CLASSES_ROOT, often are called hives, but so are pieces of the Registry that you export and import in a binary format. In addition to exporting any branch of the Registry into a REG file, which you can modify in a text editor, WinXP lets you export branches into a "hive file" format, which you edit only with Regedit itself.

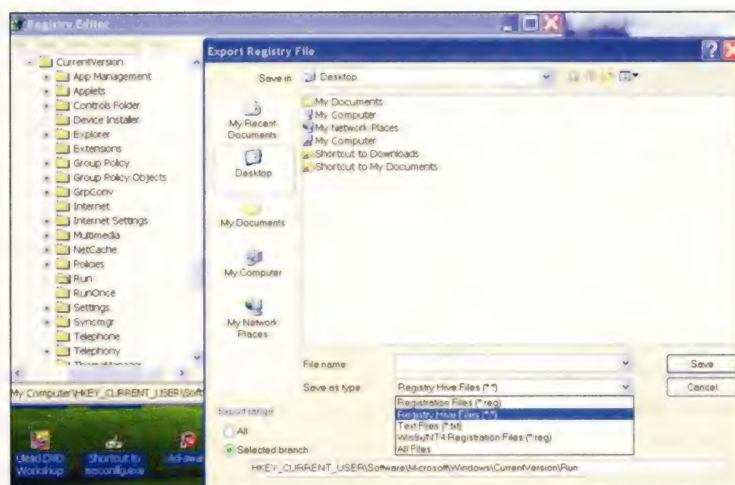
Hive files can be more powerful and versatile than REG files, and system administrators may prefer using hives to patch multiple Registries. Hive files use the same database format as the Registry itself,

and you edit them in Regedit just as you would other pieces of the Registry. Also, importing a hive file into a Registry key actually deletes the current key, its values and settings, and replaces them with the ones in the hive file. This is different from a REG patch, which simply merges its new keys and values in with existing ones in the Registry. As we saw last month, deleting keys and values through a REG patch requires setting special character flags in

hacked keys: HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\RUN. This is one of the keys that controls which programs Windows loads at start-up. (In some versions of Windows, you'll have to create this key by right-clicking CurrentVersion; choosing New, Key; and naming it Run.) Highlight the Run key and use the Favorites menu to make a bookmark. We will be moving around the Registry before returning here.

Now right-click the Run key and choose Export from the pop-up menu. In Win9x, highlight the Run key and choose Export Registry File from the Registry menu. Notice that unlike previous Windows versions, XP gives you multiple format choices in the Save As Type drop-down box. In addition to the familiar REG format, which in this case is compatible with XP, we get a

REG format for applying a compatible patch to Win9x/NT systems and an option for saving as a Registry Hive File. You can give a hive file any or no file extension because unlike the REG format, a hive file does not import itself into the Registry. We like to follow the double patch safety precaution with hive files as we did last month with REG files. Make two hive files: one backup file with the original settings for the key you are about to edit and a second copy, which we will revise. We



WinXP gives users several new formats for exporting pieces of the Registry, including the versatile hive file format.

the patch file. Hive files are simply more straightforward, and they make editing larger Registry branches much easier.

Let's use a simple illustration of editing with hive files. Open Regedit and go to one of the Registry's more commonly

saved our backup as RunTestOrig and our work file as RunTestNew.

Edit & Import The Hive

You edit a hive file by "loading" it into a temporary branch within Regedit's Registry

WinXP Tip Of The Month

Tweaks For U & I

What do you mean you don't have Tweak UI? This most versatile wrench in Windows Power Toys collection is essentially a front end for Registry tweaking. For a host of common tweaks, such as eliminating the arrows from shortcut icons or deleting outdated

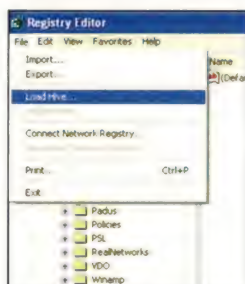
programs from the Add/Remove Programs list, Tweak UI is much more user-friendly than drilling into Regedit. To get this little marvel, go to www.microsoft.com and type **Tweak UI** in the Search box. There is a specific version just for Win XP, so be sure to download that one.

Tweak UI uses an outline tree format that organizes the interface tweaks according to general desktop look and feel qualities or specific areas of the OS, such as the Control Panel or Start menu. We really like the Taskbar switches, which let you change the defaults for how programs group themselves on the Taskbar.

tree. Regedit lets you do this only within the HKEY_LOCAL_MACHINE or the HKEY_USERS hives. Highlight one of these hives and use the Load Hive command from the File menu to bring in RunTestNew. Regedit asks you to name this key; you can use any name here because we will be eliminating this temporary branch when we unload the hive at the end of the editing process. We named ours RunTestNew, which creates a new key of that name beneath the HKLM or HKU hive. It is important to note that *loading* a hive file, which lets you edit it in Regedit, is distinct from *importing* a hive file, which actually replaces a highlighted branch of the Registry with the settings from that hive file.

The beauty of editing keys via hive patches is that you can use all of the Regedit's familiar editing tools, including adding, deleting, and modifying the settings very easily. As you can see in the Run key we're editing, each program Windows loads at startup is a Registry string value in this key. Double-click any of the listings here (excluding the default), and you will see that the value name is the title of the loaded program and the data value is the full path and file name for the program

executable. To prevent Windows from loading any of these programs at startup, simply highlight the relevant value name and delete it. To add a program for loading at startup, make a new string value and give it the program's name and put the path in as its data. We wanted Internet Explorer to open at startup, so we made a key named Explorer and typed D:\Program Files\Internet Explorer\iexplore.exe in the Value Data box.



The Load Hive command lets you edit a hive file in a temporary branch of the HKLM or HKU hives, then unload the edited patch and import it to its proper place in the Registry.

then issue the import command. In this case, choose the bookmarked key from the Favorites menu to return to and highlight the HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\

RUN. Choose Import from the File menu to bring in that revised hive file. As Regedit will warn you, this process deletes the highlighted key and its subkeys, replacing them with the imported hive file, so make sure you are in the right location.

Although we used a rudimentary example, hive files are well suited for applying edits to large parts of the Registry. Administrators who want to standardize the look and feel, naming conventions, and startup process for a number of PCs can make a template for one or more of the Registry's main hives and import it into multiple machines. The resulting hive files can be large; we saved our HKEY_CURRENT_USER hive to make a 3.5MB file. Still, this is a lot easier than tweaking each PC in an office.

Keys To The Kingdom

Speaking of large parts of the Registry, there are some choice places for tweakers

Infinite Loop Where It's @

According to the Oxford English Dictionary, no official documentation exists to define the @ symbol, even though email users know it stands for "at." Ray Tomlinson, an engineer for Bolt Beranek and Newman, first used the symbol in 1972 to separate an email username from a host name, according to "Where Wizards Stay Up Late: The Origins of the Internet" by Katie Hafner and Matthew Lyon. Tomlinson thought it was a logical choice because it already indicated "at" and because the symbol wouldn't otherwise be found in an email address.



to explore within the labyrinth that is the Registry tree. Try playing around in these favorite places.

The HKEY_CLASSES_ROOT\CLSID key contains literally thousands of listings of objects that exist throughout the Windows operating system, such as the My Computer and My Documents folders, the Start menu, and the Run command. Each of these objects registers itself with the Registry in this section, and so here is where you go to change some aspects of on-screen behavior.

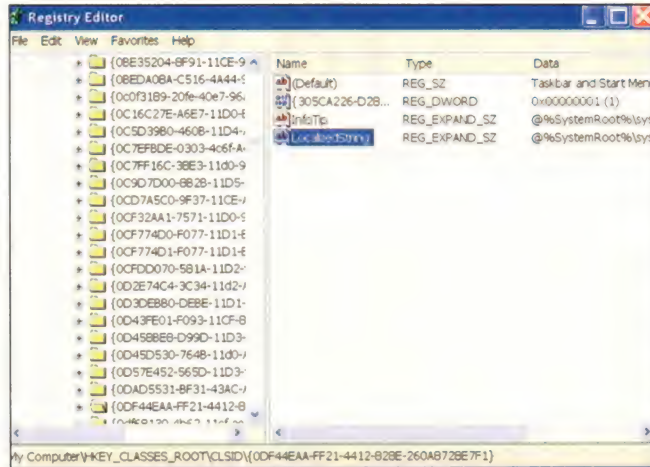
You can rename some of the labels used for common desktop objects in this section. For instance, the object governing the appearance of My Network Places is at HKEY_CLASSES_ROOT\CLSID\{208D2C60-3AEA-1069-A2D7-08002B30309D}. Objects that allow name changes all contain the value name LocalizedString and usually string data that points the Registry to a specific line number in the Shell32.dll file. To change the name, simply replace this string with whatever text you want. In our case, the My Network Places key grabs its name from @%SystemRoot%\system32\Shell32.dll,-9217. You can type *Your Name's Network Places* or any other text you want. The change is immediate, and it shows up in all of the places within Windows where you used to find My Network Places.

Here are the addresses of a few other CLSID listings that allow renaming. Win98/Me users will find the same objects at these addresses in their Registries, as well.

Recycle Bin: HKEY_CLASSES_ROOT\CLSID\{645FF040-5081-101B-9F08-00AA002F954E}

My Computer: HKEY_CLASSES_ROOT\CLSID\{20D04FE0-3AEA-1069-A2D8-08002B30309D}

My Documents: HKEY_CLASSES_ROOT\CLSID\{450D8FBA-AD25-11D0-98A8-0800361B1103}



The all-powerful HKCR\CLSID key is where many of Windows' most common desktop objects get their labels from the LocalizedString value name and the contents of their pop-up text from the InfoTip value.

Of course you can rename many system objects such as My Computer simply by right-clicking its desktop icon and using the Rename command. Many others in this area of the Registry, however, such as the Recycle Bin, require a Registry tweak. The beauty of doing the renaming in the Registry is that it makes the changes portable. Administrators can rename many pieces of the OS here, then export the entire CLSID key to a hive file and import it into multiple machines to ensure a consistent customization across machines.

What objects can you rename? Try this trick: Use the Find command (CTRL-F) to search the CLSID key for the LocalizedString value name. In most cases, items with this value name are the ones you can rename. The top Default value name for each CLSID subkey tells you which Windows object it controls.

By the way, Regedit searches are much quicker and more accurate when you use the Look at checkboxes in the Find dialog box to narrow the search to Keys, Values, or Data. In this case, we looked for LocalizedString and selected only the Values checkbox to get what we wanted. By using the F3 shortcut key to find the next instance of the last search term, you can rifle through objects in CLSID that you can rename. There are many too many of these

objects to name here, let alone test, so be careful in there and give yourself a backup before tinkering with these keys.

We can't leave the all-powerful CLSID key without pointing out the very cool InfoTip value function. Most of the keys that contain the LocalizedString value also have an InfoTip value. For instance, in WinXP, look at the HKEY_CLASSES_ROOT\CLSID\{2559a1f1-21d7-11d4-bdaf-00c04f60b9f0} key for the value controlling the Help and Support object in Windows.

The InfoTip is the value that determines text that pops up from an object when the mouse settles on it for more than a moment. You can customize this pop-up text by changing the data for InfoTip to whatever you like. **CPU**

by Steve Smith

Registry Tweak

Ultimate Registry Editor

If you are tired of waiting for long key searches in Regedit or having to hit F3 to repeat the search again and again, Registry Crawler is the ultimate solution. Available for a 30-day free trial (\$29.95 thereafter) at www.4developers.com, this program aggregates all of the search results for a term in a single window so you can choose which key really needs editing. You can delete multiple keys at once and even export the search results into a REG file. It gets even cooler when you highlight any key from the search results and have the program search Usenet groups for relevant messages about the key's function. That's what we're talkin' about! ▲

WARM UP TO PENGUINS

The Video Issues Linux Users Face

IF YOU USE LINUX, RESIDE IN THE UNITED STATES, AND WANT TO WORK IN ANY WAY WITH THE TV-OUT FUNCTION OF A VIDEO CARD OR THIRD-PARTY CARD, YOU HAVE

somewhat of a problem, as it would seem there is no legal way in the United States to utilize the TV-out function under Linux. Many users don't take this issue seriously, but maybe they should. In this first part of a two-part series, we'll discuss some of the issues surrounding using video in Linux. Next month we'll focus on exactly how to go about doing it.

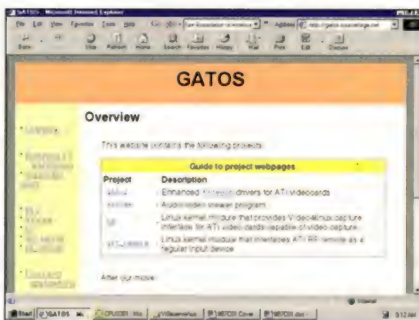
The Issues

Say you want to build your own PVR (personal video recorder) using Linux. Maybe you want this box to play a DVD you've bought, sending the output to your television via TV-out, or maybe you want to play back a television show you've recorded to your hard drive using the same method. If you're in the United States, however, and are using Linux, it would appear you'd be breaking the law.

To look closer at this issue, we need to touch on a couple of topics, including the function of TV-out and the GATOS project (<http://gatos.sourceforge.net>), which is a team of programmers that build drivers for ATI video cards. (ATI's ALL-IN-WONDER card series is where most Linux users encounter the issue of using video under Linux.) The problem isn't so much with ATI, however. The problem has more to do with Macrovision and the DMCA (Digital Millennium Copyright Act). More on this later.

Understanding TV-out's function in all of this is essential. In general, TV-out generates an image in either an NTSC

(American standard) or PAL (European standard) standard. Once data is in this standard, a television or other device can display the image, record it, and so on.



Creating a PVR under Linux is a process that has more than a few obstacles, even when using drivers built by the GATOS Project for ATI video cards for Linux users.

Anyone writing drivers can find the specs on generating NTSC and PAL, as they are open standards. The legal snag comes from Hollywood and the MPAA (Motion Picture Association of America) and also involves the copy-protection technology from Macrovision that is used on DVDs. In short, the technology adds distortion through TV-out that prevents a DVD from being copied by analog devices, such as VCRs. If you try, the image will be distorted.

The technology was originally designed to work in VCRs, and it then migrated to standalone DVD players. In these situations, it works fine. The

implementation is stored on a chip, with a player programmed to check for Macrovision's encoding to add the scrambling. Taking the technology to the PC world is a whole different story, however. Implementing this technology at the hardware-level would require collaboration between DVD drive makers, video card makers, driver programmers, and DVD player programmers.

From the point of view of DVD player authors, they have no ability to know whether your video card has TV-out functionality or not. Most player software isn't concerned about TV-out functions; it is just meant to display the DVD's contents on your monitor. Therefore, Macrovision's technology isn't usually implemented in the player software. Anyone with a TV-out function on his or her video card would get a nice, clear signal without any scrambling. In the United States, this would seem currently illegal according to the DMCA because players by law could let us circumvent copy-protection schemes.

Let's say all the DVD player authors implemented scrambling technology so folks in the United States could abide by the DMCA. This wouldn't seem to solve the legal problem, however. Even if the player supports Macrovision's technology, your video card driver has to also support it or the scrambling won't be implemented.

What if we could get the authors of drivers to implement the scrambling technology? Copy protection isn't inherently a bad thing, after all. This is where we would run into Macrovision's business model. Macrovision's copy-protection algorithm is proprietary, making it a violation, according to the DMCA, to reverse engineer the algorithm. The only way to legally implement it in a driver would seem to be purchasing a license from Macrovision.

In the world of hardware-based DVD players, this problem could probably be worked around. A big corporation, such as Panasonic or Sony, could get the license and manufacture a Macrovision chip to do the work for you. For software DVD setups, this would be a nightmare, however. You would essentially need a license for every implementation, meaning separate licenses for each driver because each make and model of card requires its own unique driver.

ATI and NVIDIA are big companies, and each could probably afford the licenses, right? This brings us back full circle to the issue of using video under Linux, and more specifically to using open-source solutions. We have got the GATOS Project doing our ATI drivers for us, so all would seem fine.

One problem. If ATI isn't writing the drivers, ATI isn't buying the Macrovision license for scrambling to be implemented in its video cards supporting TV-out in Linux. Someone has to pay for the license.

Say ATI (or another party) tries to purchase the appropriate license for the GATOS Project to use in creating drivers. Again, we hit the wall. We would have to essentially convince Macrovision that an open-source implementation of its algorithm was a licensable product. Such a version would open up Macrovision's algorithm for anyone to see, making it all but impossible to control and manage the licensing for where the algorithm is used.

Clear Vision

What if Macrovision donated a closed-source implementation of its algorithms to the open-source community? People would probably grumble, but folks not wanting to abide by the DMCA might use it. But this still doesn't solve the apparent legal problem. Because it would be *possible* to simply recompile the open-source driver and leave out the closed-source Macrovision component, the solution would seem to be illegal according to the DMCA.

Oh, and remember that Linux PVR we want to create? It would seem illegal, too. It *could* be used to circumvent

scrambling technology because Macrovision's technology is also used to scramble pay-per-view and premium channels.

The intent of Macrovision's technology is keeping you from making analog copies of DVDs. Most of us would prefer to burn it straight to another DVD and keep it digital. Macrovision has no implementation to stop you from doing this, even with legitimately licensed drivers.

So, as companies such as ATI try to play well with the Linux community by opening its specs for proper driver development, it has now seemingly given Linux developers just enough rope to hang themselves with. ATI, of course, has a Macrovision license, but it can't transfer it to the open-source driver programmers, even if it wanted to.

Hopefully, Macrovision can do something to help. That wouldn't seem to completely solve the Linux world's problems, though, as it would appear we can't legally watch DVDs via Linux in the United States because almost all commercial DVDs include CSS (Content Scrambling System). This encryption was supposed to keep people from playing a

DVD without a player with a CSS decoding license. The DMCA was designed to snag those who tampered with this fairly simple CSS encryption.

Information about how to break CSS is pretty much public knowledge, but all Linux-based DVD players would still seemingly be illegal under the DMCA. We haven't even mentioned that most Linux DVD players can break region encoding, too.

So how do driver and software writers in the United States deal with this? They get around some of it by withholding functionality (such as region encoding and TV-out support) from the base software. Some Linux users end up slinking about in the online version of back alleys, assembling their software from bits and pieces found on sites around the world. The primary problems here are working with the DMCA's guidelines and within Macrovision's licensing model.

Next month we will look at exactly what you can do to still create a legal Linux PVR. **CPU**

by Dee-Ann and Robert LeBlanc

Infinite Loop

Pricy Paranormal Implements

Januarys are cold enough to freeze your nose hairs. That's good, though, because experts say frigid weather makes it easier to detect ghosts and other paranormal phenomena. Gear up before the thaw and find spirits with these tools professional ghost hunters recommend.

Digital Camera: Pro hunters swear cameras see things our eyes and minds can't (or don't want to) perceive. A digicam with a color monitor gives you immediate feedback.

Price: At least \$200

Electromagnetic Field (EMF) Meter:

The constant companion of ghost hunters everywhere, EMF meters detect disturbances spirits cause.

Price: \$130

Geiger Counter:

No, you're not going to Chernobyl. Helps detect radiation flux due to paranormal activity.

Price: \$275

Infrared Remote Thermometer:

Helps pinpoint ectoplasmic ghosts that are 25 to 60 degrees colder than the air around them.

Price: \$150

Ion Detector: You thought that balloon caused the static changes that made your hair stand up; it was actually your great grandpa's hand. Find him and say hello.

Price: \$500



BRIDGE FOR SALE: \$150



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KILLER HARDWARE TIPS

A Sweetly Silent PC, Wavering On Wireless & Giving Newton A New Life

IF YOU'RE A USER WHO CAN'T LEAVE THINGS ALONE IF THERE'S A CHANCE YOU CAN MAKE THEM BETTER, EVEN IF IT MEANS BUCKING THE NORM, READ ON. WE HAVE SOME TIPS

and tricks that just might make you more productive.

Shhhhhhhh!

With a press of a button, your PC powers up, and a din like a jumbo jet barreling down the runway replaces the quiet serenity of your home or office. Most PCs are fairly loud due to whirring fans and spinning drives. An overclocked PC—for which cooling is especially critical—is often most offensive to the ears.

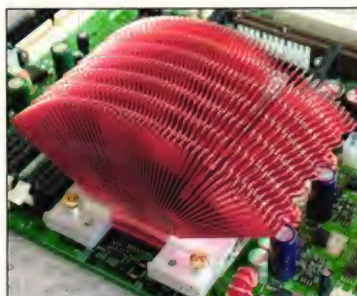
Many of us make our PCs faster or prettier, but few of us concentrate on making them quieter. Carl Nelson, however, built a near-silent PC. He documented the experience at www.hardcoreware.net/reviews/other/silent_pc/1.php. Nelson says the project lowered his PC's sound level to 1/20th of its original intensity, from 66dBs (a level between normal conversation and busy street traffic) to 45dBs (slightly louder than a refrigerator humming).

"My theory of building a silent PC is to build one that is as quiet as possible, but at the same time does not sacrifice speed or looks," Nelson says. Nelson's machine uses a 2.8GHz Pentium 4 and an overclocked video card, both running without fans. (The PC's only fan cools the power supply.)

This is the biggest secret to reducing noise: Replace fans with passive heatsinks, which dissipate heat without moving parts. Nelson used passive heatsinks on the CPU and video processor. Although

both ran slightly hotter than with active heatsinks (or fans), both were within the limitations of the hardware.

The principal risk in making a super-quiet PC is heat; it's important to test components to make sure they're not sweltering. "Having everything on a PC



The Zalman CNPS6500A-Cu looks like a modern art installation, but it is actually a fanless copper heatsink.

running beyond specified heat levels for a long period of time may contribute to lower lifespan of components," Nelson says. His goal is to keep components within the recommended thermal spec while keeping the noise down. You can accomplish this by using specialty products from such manufacturers as Zalman and Thermaltake.

Because of the heat issue, overclocking and silence usually don't go hand in hand. "It really depends on what you are trying to overclock and how far you are trying to take it," Nelson says. "I had a GeForce4 Ti 4200 running just as fast with a passive heatsink as I did

with the big stock heatsink-fan unit. However, there is no way I would recommend someone try something like that with their Athlon XP processor."

In addition to passive heatsinks, Nelson's system keeps things hush-hush via a power supply with a near-silent fan, a hard drive with acoustic management functions, and a large case to maximize airflow. Other available sound-quenching devices include drive enclosures, sealed PC cases, and sound-dampening materials. Check out SiliconAcoustics.com and Quietpc.ca for such products.

To make your PC significantly quieter without going whole-hog, just replace the single loudest component. "For most people, especially AMD users, this is the CPU heatsink-fan unit," Nelson says. "OEM heatsink fans are usually small fans spinning at a very high speed to keep those Athlon XPs cool. Intel's cooler for their Pentium 4s are very quiet to begin with," he adds.

The next loudest component on most systems is the power supply fan. Several companies, including Antec, Enermax, and Thermaltake, offer quiet replacement power supplies.

A larger, lower-RPM fan can move the same amount of air (or more) as a smaller, high-RPM fan usually associated with performance cooling. Many fans have variable speeds, either controlled by the user or relative to temperature. "I recently replaced a friend's stock heatsink with a Thermaltake Volcano 9," Nelson says. "The fan will only spin as fast as it needs to in order to keep the CPU cool. I actually added two more low-RPM fans to his system to further improve airflow, and it is still quieter than it was before."

More information about computer acoustics is available at Silent PC Review, a site dedicated to reviews, news, and information about quiet computers and components.

The Future Of Wi-Fi

Now that new wireless networking standards are on the horizon, is your 802.11b network obsolete? "It's definitely not obsolete because the newer technologies will either be backwards compatible or have a variety of limitations in terms of distance and compatibility that might not make it appropriate as a replacement," says Glenn Fleishman, author of the 802.11b Networking News blog (80211b.weblogger.com).

Nonetheless, new protocols have advantages that may make you want to upgrade. The two next-gen wireless standards that are competing for dollars and airtime are 802.11a and 802.11g. 802.11g promises to

deliver up to 54Mbps of throughput and will be backwards compatible with existing 802.11b networks. The protocol is due for ratification by summer, but manufacturers will likely start shipping equipment that is upgradeable to 802.11g by spring. 802.11a, which several vendors are now shipping, also works at 54Mbps (future versions may zoom along at 108Mbps) but isn't compatible with 802.11b.

"802.11a has more spectrum available to it, so it has eight nonoverlapping channels for indoor use and four for outdoor use. You can put out a little more power on outdoor use, which could allow you to have high-speed, long-distance point-to-point links that are impossible with b," Fleishman says.

If you want the best of both worlds until the marketplace decides a protocol winner, there is a neutral solution. Several vendors offer cards and access points for 802.11a and 802.11b (simultaneously for access points, one at a time for PC cards).

If the choice between a and g isn't confusing enough, there's yet another option. A variant of 802.11b, which boosts throughput from 11 to 22Mbps, is now available from some manufacturers. "They're using Texas Instruments ACX100 chipset, which implements TI's

proprietary Packet Binary Convolution Coding encoding algorithm to produce greater throughput in 2.4GHz. The PBCC algorithm is actually one of the approved encodings for 802.11g, but the way that TI put PBCC into their ACX100 chipsets, they will not be upgradeable to 802.11g," Fleishman says. So if you buy a 22Mbps 2.4GHz access point today, you won't get that speed when using 802.11g devices in the future.

While you're considering all these protocols, keep in mind that the throughput numbers are theoretical. Networking overhead and physical obstacles take a big chunk of your bandwidth. "802.11b is really about 4 to 7Mbps after subtract-

ing overhead. It looks like 802.11a devices at 54Mbps provide about 20-odd Mbps of real-data throughput. I would be surprised if 802.11g topped 20Mbps and wasn't more like 15Mbps," Fleishman says.

Newton, Still Going Strong

The Newton, Apple's foray into PDAs, might have been discontinued in 1998, but it lives on thanks to an active online community. Advocates say that many Newton features—including large screens and handwriting recognition—made it a PDA ahead of its time, and ahead of modern PDAs, too. Legions of Newton users still release hardware upgrades and software add-ons, so if there's a Newton buried in your closet, take it out, dust it off, and put it back to work.

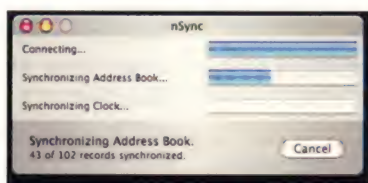
First you'll need software to synchronize data on your Newton with your computer. NewtSync (www.everchanging.com/newton) is a Mac OS X utility that moves data between a Newton and your Mac's address book and calendar apps. The alpha-version software currently works only with a serial connection. Syncing via TCP/IP and infrared is planned.

You can also play your MP3s on a Newton. MAD Max (www.40hz.org/MADNewton) plays MP3 files and

Icecast and SHOUTcast MP3 streams on Newton MessagePads 2000 and 2100. A special plug-in for iTunes (www.pixell.net/doppler/newton) moves music from your Mac over a serial or Ethernet connection. There are some tradeoffs: It takes two hours to move 20MB of music over a serial connection. To play MP3s on a Newton, the recommended parameters to use are 112Kbps, 22KHz bit rate, mono—not exactly high fidelity. And because the Newton doesn't have a headphone jack, you'll have to add one yourself.

You can also soup up your Newton with an 802.11b wireless card (www.ffmpeg4u.or.jp/~ngc/eng/newtwave.htm) and CompactFlash storage (www.kallisys.com/newton/ata). Geeks R Us and Planet Newton have other software, news, and hacks. **COU**

by Kevin Savetz



NewtSync moves your address book and to-do list between your Mac and Newton.

Infinite Loop

Your Move, Circuit Breath

Think that Quake bot is giving you a headache?

Computers are turning chess into a battle of man against machine. Here's a brief look at AI's evolution in the chess world.

1948 Alan Turing creates a chess algorithm for calculating machines (he later commits suicide by eating a cyanide-laced apple).

1988 Carnegie-Mellon University's chess program, Hitech, beats American grandmaster Arnold Denker.

1996 World Champion Gary Kasparov beats IBM's Deep Blue computer 4-2 in a six-game match.

1997 Deep Blue beats Kasparov in a six-game rematch.

2002 27-year-old World Champion Vladimir Kramnik and the German computer Deep Fritz ended an eight-game match in a draw. Kramnik won two games early in the match, and Deep Fritz won two after the break.



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Technically Speaking

An Interview With Bob Young, Co-Founder & Former CEO Of Red Hat Linux

Recent numbers from market research firm IDC show that Red Hat now owns more than 50% of the burgeoning Linux market and boasts roughly \$20 million in sales per quarter. But when Bob Young founded ACC Corp. (later Red Hat) with Marc Ewing in 1994, he ran the company from his wife's sewing closet with little more than a couple of newsletter mailing lists on which to stake his future. In time, Young forged arguably the biggest and best threat to Microsoft's OS dominance—so much so that Microsoft lawyers held up a copy of Red Hat Linux during its antitrust trials to prove it didn't own a monopoly.

Today, Young is still a major shareholder and director of Red Hat, but he's the kind of man who needs to create, not just carry on. Young's time at Red Hat steeped him in the complex and many-faulted world of intellectual property and publishing. Just as he saw an opportunity with Red Hat and Linux in 1994, Young believes a similar chance exists in publishing over the coming decade. His new brainchild is Lulu Press. If all goes according to plan, Lulu will become the hub of tomorrow's publishing world. ▲

by William Van Winkle



CPU: Do you ever wish you were still Red Hat's CEO?

Young: I'm an entrepreneur both by temperament and by training. And so I just don't have that much to contribute now. The company continues to improve its standards of recruiting to the point today that there's not a chance either Marc Ewing or I would ever get a job at Red Hat, which is one of the reasons I remain a big shareholder. Any company that's smart enough not to hire guys like me has got to be going somewhere.

CPU: The company outgrew you.

Young: Absolutely. And that was the plan all along. It's a tiny minority of companies where the founders end up becoming the CEOs of billion-dollar companies. In the vast majority of successful new companies, the founders understand their strengths, which are identifying new

markets and developing innovative products or technology to address that market. But once that market's proven, you really need a more disciplined, process-oriented management team to scale the business on a global basis. I've never had the training for that, but even worse, I've never really had the interest. My interest is in developing new products for new marketplaces.

CPU: You're an idea man.

Young: Well, I don't think of myself that way. Idea men work at universities or write books. I think of myself as a salesman. Come the revolution, I'll be back to selling you Fuller brushes door to door.

CPU: Before the IT bubble burst in 2000, IDC predicted that Linux shipments would show 28% annual growth from 1999 to 2004. How far off the mark did that turn out to be?

Young: If you define it narrowly in the server space, it's got to be at a minimum on the mark, if not slightly conservative. Our market share in the server space is very exciting, but what you have to understand—and this is essential for anyone following the Linux space—is people regularly confuse Linux with just another server-side OS for running Oracle databases. In actual fact, the real success of it has been as the operating system of choice to server applications that never existed before. Take people like TiVo, for example, who are making set-top boxes. These boxes have to be intelligent because they need to communicate with the central servers that TiVo runs, not just as a client but actually as a server itself. The problem is that TiVo is selling a \$200 box, and the typical price of a license for Microsoft Windows 2000 server products starts at several hundred dollars and goes up from

there. In other words, the software for the operating system costs more than the device TiVo was trying to ship to their customers. So suddenly, by having open-source technologies like Red Hat Linux out there, it enables technologies to be delivered to the marketplace that simply were not economically possible prior to the creation of this open-source software movement and of companies like Red Hat.

CPU: Do you think Linux will ever gain traction on the desktop?

Young: Again, I always argue that it's a false question because in actual fact we're hugely successful. This falls under the category of "When will my mother use Linux?" Well, does your mother own a TiVo box? "When will my kid sister use Linux?" Well, does your kid sister play with the Sony PlayStation or PlayStation 2? "When will my grandmother use Linux?" Well, does your grandmother ever do a search on Google? Google runs 15,000 Linux servers at last count to power their searches, so whenever you do a search on Google, you're using Red Hat Linux.

CPU: What is the single biggest threat to Microsoft's market dominance?

Young: Let me hedge like crazy. Microsoft has like what, 40 billion dollars of cash in the bank, increasing at something around \$10 or \$20 billion a year? They have free cash flow in their operations greater than all but maybe 10 other players in the industry have in total revenue. Microsoft is probably the best-run technology company this industry has ever seen with the exception of IBM under the Watsons. Having said that, Microsoft may do evil things. It's just that they do them so well you have to admire them. It astounds me that Bill Gates still gets up in public and proclaims genuinely not to understand why the Justice Department is pursuing him. These guys are so aggressive that they ignore any law that's not being enforced.

So in that context, what is the biggest threat to Microsoft? It has to be the open-source movement. It has to be the issue of empowering the user because Microsoft's business model is based on keeping the user subservient to their technology. The open-source movement is all about giving power to the user. People would say to me, "What you guys are doing at Red Hat is so unique. What other industries would it work in?" And I would say, "No, you've got it backwards. With free-market democracy, every industry works the way the open-source model works." If you buy a toaster at Wal-Mart, you don't have to go back to Wal-Mart to get that toaster repaired or to buy another one. But in the proprietary-software business, if you build your business around someone's database, say from Oracle, or an operating system from IBM or Microsoft because you only have the binaries and not the source code, plus you've signed a license that basically says if you make any changes to the technology, the vendor can have you thrown into jail. It's only the software industry that works under this model where the customer has to go to the vendor, cap in hand, and say, "Please, sir, fix this bug for me." Open source is about running our industry the way every other industry in a free-market democracy works.

CPU: What is your background in publishing?

Young: ACC Corp., which became Red Hat, was my only background in publishing. We did a newsletter for the New York area, and I also helped Phil Hughes launch the "Linux Journal" back in 1993. Although back in high school, I was made a librarian in the high school library. That was normally a job you applied for, but they made me become a librarian because I checked more books out of the library than anyone else in the school that year. So that was how they got me to put my books back on the shelf.

CPU: Your efforts with Lulu Press [www.lulupress.com] started with a company called OpenMind. Who were they?

Young: OpenMind was a startup that focused on trying to build an engine that would enable publishers to reach their audience. It was basically epublishing. Publishers who didn't have the technical capability themselves would have a tool to be able to deliver their content to customers electronically on a more cost-efficient basis than turning it into dead trees. The problem that OpenMind had was that they were somewhat underfunded, as well as they were following too much of the existing model. They didn't really solve a new problem. They only saved people 10% or maybe 20% of the cost of getting the content of a book, and that wasn't enough improvement to make anyone very excited. But they had some very good people and years of research, so when OpenMind failed I stepped in and bought some of the assets and was able to recruit some of the smarter people that OpenMind had.

CPU: You've said that Lulu is trying to establish a publishing marketplace.

Young: It's similar to the way eBay doesn't really sell you anything. eBay is a marketplace that enables the seller to talk more efficiently to the consumer. Previously, if you owned a DeLorean car and you were in New Jersey, you had no way of directly addressing a potential buyer sitting in California. What we're trying to do with Lulu Press is, over time, create that same marketplace, starting one market at a time. In the same way that eBay started with PEZ dispensers and catered to the community of PEZ buyers and sellers, we are going to start with one line of books or subject area at a time and eventually build a big enough marketplace that it makes sense for an author or small publisher to address the marketplace he can address through Lulu Press. **COU**

To read our entire interview with Bob Young, go to
www.cpumag.com/cpujan03/young

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PROVEN SOLUTIONS FOR STORAGE MANAGEMENT

Under Development

A Peek At What's Brewing In The Laboratory

Fresh from the most influential R&D labs around the world, here's a glimpse at some of the technology that scientists, lab techs, and researchers are cooking up for the future.

Dial-A-Droid

If you can survive your cell phone's radiation long enough, Fujitsu may soon have another use for your handset: controlling your home robot. In October, Fujitsu Laboratories unveiled its latest ambulatory android, the MARON-1. The 32- x 36- x 32-cm machine features two wheels, a rotating arm, and a camera head that pans and tilts the bot's beady twin eyeballs. An infrared sensor/emitter lets MARON-1 operate as a universal remote control, plus it has a speaker and microphone so it can act as a telephone.

MARON-1 is in some part a PC running Windows CE 3.0, with one USB port, a PC card slot, and one RS-232C port for maintenance. You can program the robot via a touchpad, five menu keys, and 4-inch LCD monitor. The MARON-1 can keep blinking in low-power mode for as long as 12 hours when running on its NiMH battery.

What makes MARON-1 cool is that you can control it via cell phone. The robot's PHS communication card is only compatible with NTT DoCoMo's i-appli software, but future revisions could easily port to North American-friendly platforms. With a smart phone, users can instruct MARON-1 how to move or, if destinations have been preprogrammed into its memory, where to go. You can also tell it to patrol a designated route and send snapshots to your cell phone screen. And, if you forget to program the VCR to tape a favorite show, just buzz

MARON-1 and tell it to beam your VCR's Record command at the VCR.

In other robotic news, not all of the United Nations is focused on coping with the Middle East. The World 2002 Robotics Report drafted by the U.N. Economic Commission for Europe notes that although 2001 sales of domestic robots (excluding games and



Fujitsu's new MARON-1 robot can operate your home theater, call your parents, and send you pictures of your home when you're away, all through the control of your cell phone.

toys) totaled 21,500 units, the number is expected to balloon to more than 700,000 units during 2002 to 2005. Falling robot prices, improving technology, and falling labor costs are seen as being principal drivers in the near-future robot boom. ▲

2D Or Not 2D, That Is Sharp's LCD

Sharp isn't the industry's pioneer in 3D-display technology. That honor largely falls to Dimension Technologies, which owns many 3D patents and has been selling 3D LCD displays for more than a decade. Philips Research also has its own method for making 3D images on a flat-panel screen. Gone are the red-green glasses and headaches from the days of creature feature matinees. You just sit in front of the screen—right in front without moving from side to side—and objects leap from the glass.

Unfortunately, because of restrictions on the user's viewing position, 3D monitors aren't well suited to various applications, gaming not least of all. (At least not if you're the type who flops around while dodging on-screen weapons fire.) Sometimes you want 3D, sometimes you don't. Sharp has designed a screen technology to give you the best of both worlds. The company's Switching LCD depends on a technique called a parallax barrier.

"The Switching LCD establishes an optical parallax barrier," Sharp notes in a statement, "and by controlling the path of travel of light, makes it possible to separate the display images so that slightly different images reach the left and right eyes. In addition, the Switching LCD electrically controls the parallax barrier to make it transparent, eliminating its ability to separate light paths. This way the right and left eyes can see the same image when viewing ordinary 2D content."

In other words, the LCD barriers built into the panel that separate the light streams into left and right channels can be turned dark or transparent at will. Sharp hasn't released an estimate on when its 2D/3D displays will reach the market, but the company expects formats to include everything from PDAs to picture books to large-format LCD TVs. ▲

Cell Phones That Touch Your Heart

Forget about tracking a person's location with his cell phone. How about tracking his health? Bell Labs husband-and-wife research team, Victor Lubecke and Olga Boric-Lubecke, have discovered that signals sent from a cell phone antenna can help probe certain vital statistics. The phone can relay these stats to a remote location, such as paramedics or an outpatient monitoring service.

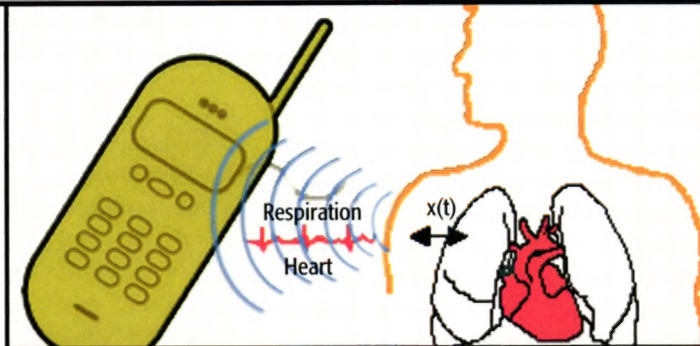
The technology hinges on the Doppler effect, the same wave signal compression and expansion phenomenon that makes sirens sound higher-pitched when coming to you and lower-pitched moving away. The phone's antenna emits and receives signals, including signals bounced off of objects, such as a user's heart. As the organ expands and contracts, the changes in distance between the phone and heart's wall are measured by computing the Doppler shift in the cellular wave signals caused by the heart's motion. Thus, heart rate is determined. The Lubeckes proved the effect in a lab setting and are working on a prototype sensor to plug into a phone's headphone jack.

"In some cases the function might be similar to that of Holter or bedside monitors and other wired-sensor techniques, but the use of wireless technology and its infrastructure can potentially be less invasive and more cost effective," says Victor Lubecke.

Lubecke says a chief problem is detecting and ignoring unwanted motion. The system now only works if the user is very still. Lubecke expects future developments in signal processing and filtering will help.

On a somewhat related front, Fiorenzo Marinelli and fellow National Research Council researchers in Bologna, Italy, demonstrated in October that cancerous cells exposed to cell phone radio waves for 48 continuous hours replicated more aggressively than those that remained unexposed. The results aren't viewed as being indicative of a direct threat to human health, but they do show that more research is needed. ▲

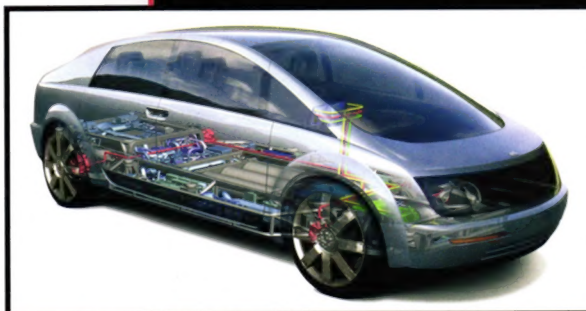
In a crisis, new technology from Bell Labs can tell the difference between life and death. Signals from a cell phone bounced off of internal organs can tell observers a person's vital statistics.



GM's Next-Gen Hy-Wire Act

In the *CPU's* August 2002 issue (page 52), we warned you to expect drive-by-wire systems *someday*. General Motors' latest prototype, the Hy-Wire, shows that someday is nearly here.

By-wire systems replace conventional automobile shafts and cables with single wires, usually optical fiber lines. For example, rather than a bulky, costly arrangement linking the steering wheel to the axle



Blending a hydrogen fuel cell with drive-by-wire technologies, GM's new Hy-Wire concept car exemplifies the kind of environmentally friendly, supremely flexible vehicle we can expect to see on roads in the coming decade.

system, one wire (plus redundants for safety)

would make the connection. Many throttle systems have already gone to by-wire designs. Braking systems are expected next.

A bumper-to-bumper drive-by-wire vehicle would essentially be a collection of PnP components. Hy-Wire's foundation is an 11-inch-thick "skateboard" that fits neatly beneath a broad selection of body types. There's no engine block to obstruct the driver's view or potentially even foot pedals.

"By-wire systems give the customer the option to configure his or her vehicle the way they want to," says Robert Vitale, staff research engineer at GM's R&D center. "For example, you could give the customer a variation of interfaces, whether they be joysticks or a steering wheel or something in between. It would be an excellent support system for a handicapped person. The body-on-chassis system will let users change bodies at will. Someone who graduates from college and goes on to have a family of two or three children could change the body from, say, a sports vehicle or sedan to a minivan or a truck. The skateboard software just talks to the body software and then configures the suspension and other driving characteristics of that skateboard accordingly."

The driving system featured on the Hy-Wire concept vehicle features motorcycle-like handgrips. The user brakes by squeezing. GM calls this the X-drive.

Hy-Wire marks the first pairing of drive-by-wire with fuel-cell technology. Unlike today's hybrid cars, which require gas, a fuel cell uses hydrogen and only emits heat and water. Vitale says GM is unsure whether to design a way for "waste" water to cycle back into the vehicle or emit as water vapor.

Fuel-cell systems are still too expensive to replace conventional engines. Vitale expects a "small fleet" of Hy-Wire-type vehicles by 2010. ▲

Back Door

Q&A With Rob Glaser

You break a sweat just listening to Rob Glaser. As the founder, chairman, and CEO of streaming media titan RealNetworks, Glaser has to be quick-witted and all-encompassing. His dream is to take radio and TV, update the media 21st-century style, and deliver it over the Internet—a vision he's close to achieving. Just as Glaser must outthink and outpace his competitors, he brings the same wide-ranging speed to conversations. Before you've finished asking a question, Glaser has answered it in his head and moved on to two new ideas based on the first. He then tries to drag you along behind his thought process like a skateboarder roped to the back bumper of a Porsche. If you can survive the trip, it'll have been one hell of a ride.

Q What drove you to leave Microsoft in 1993?

GLASER: I was always interested in the convergence of digital technology—computers, media, and communication networks. If you think back in 1993, people thought that there was going to be this big future based around digital television set tops. But the conventional wisdom seemed like it was dead wrong, because this conventional model of digital set tops coming down from above with fully baked architectures and all these interactive applications had no way of bootstrapping itself, either financially or technologically. There were no operating systems established, no communication protocols established, no development tools, all that stuff. Meanwhile, there was this other architecture that kind of came out of the academic research and military environments that had basic infrastructure in place, that had extensibility, that had scalability, that I came to feel was going to be the future for how all interactive digital communication services would be delivered. So by the beginning of 1994, I decided to bet my future and bring interactive media to that platform.



Q To an outside observer, it would seem Real missed the boat on portable audio players. Although WMA is supported on an increasing number of MP3 and CD players, I can only recall the RCA Lyra supporting Real.

GLASER: Our assessment was that for portable players that are playing downloads, MP3 is the most important format. For streaming players, like mobile phones and the like, native Real support is most important.

Q With RealOne, subscribers don't own their music; they license it. This seems to be another step toward curtailing acceptable use and people not owning content. Is this unavoidable?

GLASER: Sony sells radios. So does that mean that Sony doesn't let you own the music because the radio is only a device that lets you listen to audio that's broadcast? No, not at all. Sony sells radios and televisions, but Sony also sells DVD players and CD players. We support both the access to the content where the content is broadcast once or listened to once, where it's accessed on a subscription basis of some kind, and also ownership models. What we have in the latest RealOne is CD ripping, burning, and DVD playback.

The music industry has had the problem that the pirate services got out in front of what they were preparing to offer. I think there is some point where the content offerings will be better and easier than the pirate services, but the music industry's not quite there yet.

Q Where is streaming media headed? Will we be watching wide-screen TV over IP soon, or will streaming really find its purpose in wireless devices?

GLASER: I think both. I think IP's going to be everywhere, right? IP's going to be on mobile phones, on digital set tops. IP's going to be the thing in the home network that takes the content in to whatever the gateway device is, be it the PC or set top box, and distribute it around. We have substantial development going in both the mobile area and the home A/V device area. I tend to think it's one of the lessons of history that these new platform things take a little longer to shake out than you'd think because of the complexity of doing this stuff and the fact that before things are at critical mass, it's awfully expensive to implement on every possible device that could be out there.

At the end of August, I was in Spain using one of these new Nokia picture phones, the 7650, just seeing how in Europe text messaging is already huge, then you get picture messaging on top of that, then you get audio/video streaming using RealOne on top of that. I think that's going to be huge.

For our complete interview with Rob Glaser, go to www.cpumag.com/cpujan03/glaser.

William Van Winkle began writing for computer magazines in 1996. He was first published in 1990, the same year he took his first job in computers. He and his family live outside of Portland, Ore.



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